VOLUME 20 / NUMBER 23
DECEMBER 8, 1982
ACC. NOS. N82-32301 TO N82-33333

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Scientific and Technical Aerospace Reports, Volume 20, is prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by PRC Government Information Systems.

The Administrator of the National Aeronautics and Space Administration has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Agency. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through **February 28, 1985.**

US ISSN 0036-8741

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For related information see also *Astronautics*.

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For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **N.A.**

89 ASTRONOMY **3376**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **3378**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **3378**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **3379**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **3380**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **3381**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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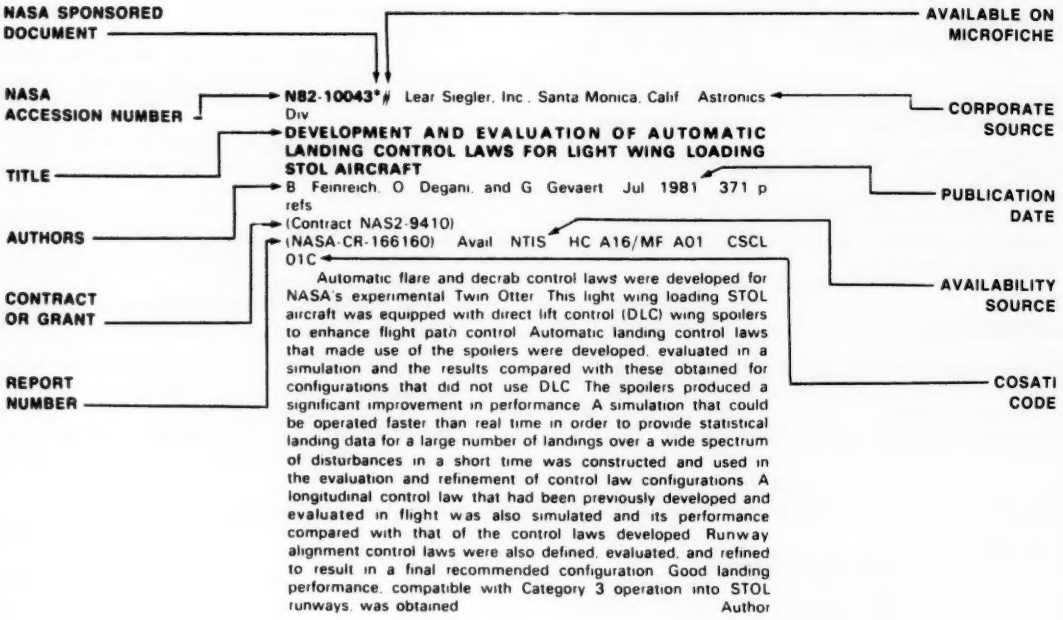
TYPICAL CITATION AND ABSTRACT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NASA ACCESSION NUMBER
N82-10043*# Lear Siegler, Inc., Santa Monica, Calif. Astronics Div
CORPORATE SOURCE
TITLE
DEVELOPMENT AND EVALUATION OF AUTOMATIC LANDING CONTROL LAWS FOR LIGHT WING LOADING STOL AIRCRAFT
AUTHORS
B. Feinreich, O. Degani, and G. Gevaert. Jul. 1981. 371 p. refs
PUBLICATION DATE
CONTRACT OR GRANT
(Contract NAS2-9410)
(NASA-CR-166160) Avail: NTIS HC A16/MF A01 CSCL 01C
AVAILABILITY SOURCE
REPORT NUMBER
Automatic flare and decrab control laws were developed for NASA's experimental Twin Otter. This light wing loading STOL aircraft was equipped with direct lift control (DLC) wing spoilers to enhance flight path control. Automatic landing control laws that made use of the spoilers were developed, evaluated in a simulation and the results compared with these obtained for configurations that did not use DLC. The spoilers produced a significant improvement in performance. A simulation that could be operated faster than real time in order to provide statistical landing data for a large number of landings over a wide spectrum of disturbances in a short time was constructed and used in the evaluation and refinement of control law configurations. A longitudinal control law that had been previously developed and evaluated in flight was also simulated and its performance compared with that of the control laws developed. Runway alignment control laws were also defined, evaluated, and refined to result in a final recommended configuration. Good landing performance, compatible with Category 3 operation into STOL runways, was obtained. Author
COSATI CODE

VOLUME 20 NUMBER 23 DECEMBER 8, 1982

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N82-32301# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 14, NO. 7 Monthly Report
Ronald L. Eshleman, ed., Judith Nagle-Eshleman, ed., and Milda Z. Tamulionis, ed. Jul. 1982 121 p refs
(AD-A117323) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Transonic blade flutter, active control technology in aircraft, and wind-excited behavior of structures are discussed. For individual titles, see N82-32302 through N82-32304.

N82-32302# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.
TRANSONIC BLADE FLUTTER: A SURVEY OF NEW DEVELOPMENTS **c02**
M. F. Platzer *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 7 Jul. 1982 p 3-8 refs (For primary document see N82-32301 23-01)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01A

A review of current work in transonic blade flutter research is presented. Aerodynamic analyses for the prediction of attached flow flutter, choke flutter, and stall flutter are described. Unsteady aerodynamic measurement and flutter test programs to investigate transonic blade flutter phenomena are also reviewed. Author

N82-32303# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
ACTIVE CONTROL TECHNOLOGY IN AIRCRAFT **c08**
D. McLean *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 7 Jul. 1982 p 11-22 refs (For primary document see N82-32301 23-01)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01C

Developments in active control technology on aircraft are described. The following functions are described: relaxed static stability, maneuver load control, fatigue reduction, ride control, flutter mode control, and gust load alleviation. Author

N82-32304# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
WIND EXCITED BEHAVIOUR OF STRUCTURES 3 **c02**
D. J. Johns *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 7 Jul. 1982 p 23-38 refs (For primary document see N82-32301 23-01)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01A

Literature on wind-excited behavior of structures is reviewed. Among the phenomena considered are those due to vortex shedding, galloping, flutter, divergence, and turbulence. Theoretical and experimental (model and full scale) studies are included as are techniques to alleviate wind excited behavior. Author

N82-32305# Army War Coll., Carlisle Barracks, Pa.
FOREIGN (TURBINE POWERED) HELICOPTER PRODUCTION: A THREAT TO THE UNITED STATES PRODUCTION BASE
James E. Gauze 28 Apr. 1982 34 p refs
(AD-A116755) Avail: NTIS HC A03/MF A01 CSCL 05/3

The trends in world helicopter sales, the preceptions held by potential buyers, the market growth through the end of the 1980's, are addressed. The more significant disincentives which maybe placing the U.S. industry in less than a fully competitive position are discussed. GRA

N82-32306# Air Force Human Resources Lab., Wright-Patterson AFB, Ohio. Logistics Research Branch.
MAINTENANCE SUPPORT RESOURCE FORECASTING MODELS, VOLUME 1 Final Technical Paper
Sharon R. Nichols and Stacey A. Fenner Brooks AFB, Tex. Jun. 1982 40 p refs Submitted for publication
(AF Proj. 1710)
(AD-A117143; AFHRL-TP-82-12(1)) Avail: NTIS HC A03/MF A01 CSCL 05/2

Document describes three maintenance support resource forecasting models. They are the Logistics Composite Model (LCOM), Reliability and Maintainability Model (R&M), and the Expected Values Model (EVM). The objective of this study is to analyze these three models in terms of (a) how they relate to each other, (b) the minimal data requirements of each model, (c) how the models can best be used in the weapon system acquisition process (WSAP), and (d) lastly, whether the models generate roughly equivalent results. In meeting these objectives, all three models are compared in terms of input requirements, method of processing, and output products. Volume 1 of this paper gives the analytic portion of the study. The results of the equivalence testing for the two average value models are included in Volume 2. The second volume also contains a final section discussing conclusions from the study. GRA

N82-32307# Air Force Human Resources Lab., Wright-Patterson AFB, Ohio. Logistics Research Branch.
MAINTENANCE SUPPORT RESOURCE FORECASTING MODELS. VOLUME 2: EQUIVALENCE TESTING OF RELIABILITY AND MAINTENANCE MODEL AND EXPECTED VALUES MODEL Final Technical Paper
Sharon R. Nichols Brooks AFB, Tex. Jun. 1982 57 p Submitted for publication
(AD-A117149; AFHRL-TP-82-12(2)) Avail: NTIS HC A04/MF A01 CSCL 05/2

Three maintenance support resource forecasting models were developed. They are the logistics composite model (LCOM), reliability and maintainability model (R&M), and the expected values model (EVM). These three models were analyzed in terms of: (1) how they relate to each other, (2) the minimal data requirements of each model, (3) how the models can best be used in the weapon system acquisition process, and (4) whether the models

generate roughly equivalent results. All three models were compared in terms of input requirements, method of processing, and output products. The results of the equivalence testing for the two average value models are included. The results of the equivalence testing for the two average value models are included. GRA

N82-32308# European Space Agency, Paris (France).
MATHEMATICAL MODEL FOR A MAINTENANCE PROGRAM FOR MODERN JET AIRCRAFT
Rudolf Prinz, Hans-Christian Goetting, Karl-Heinz Galda, and Juergen Kreth Mar. 1982 50 p refs Transl. into ENGLISH of "Math. Modell fuer eine Instandhaltungsphil. moderner Verkehrsflugzeuge" rept. DFVLR-FB-81-14 DFVLR, Brunswick, Oct. 1980 43 p
(ESA-TT-724; DFVLR-FB-81-14) Avail: NTIS HC A03/MF A01; original German version available from DFVLR, Cologne DM 10,40

Step-by-step extension of structural inspection intervals, based on long-term experience in operating a fleet of commercial aircraft, is described by a mathematical model. The model is founded on the statistical distributions for stress and for the appearance of a detectable incipient crack in fatigue-stressed components. By assuming realistic values for failure probability, the admissible inspection intervals can be calculated. The result is an extension of the intervals up to a maximum level, followed by a reduction in the intervals as the anticipated value for detectable incipient cracks is approached. Model results are very similar to those obtained in practice. Author (ESA)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N82-32309*# Mississippi State Univ., Mississippi State. Coll. of Engineering.
AN IMPLICIT SOLUTION OF THE THREE-DIMENSIONAL NAVIER-STOKES EQUATIONS FOR AN AIRFOIL SPANNING A WIND TUNNEL Ph.D. Thesis
Anutosh Moitra Aug. 1982 92 p refs
(Grant NsG-1623)
(NASA-CR-169220; NAS 1.26:169220) Avail: NTIS HC A05/MF A01 CSCL 01A

An implicit finite-difference algorithm is developed for the numerical solution of the incompressible three dimensional Navier-Stokes equations in the non-conservative primitive-variable formulation. The flow field about an airfoil spanning a wind-tunnel is computed. The coordinate system is generated by an extension of the two dimensional body-fitted coordinate generation techniques of Thompson, as well as that of Sorenson, into three dimensions. Two dimensional grids are stacked along a spanwise coordinate defined by a simple analytical function. A Poisson pressure equation for advancing the pressure in time is arrived at by performing a divergence operation on the momentum equations. The pressure at each time-step is calculated on the assumption that continuity be unconditionally satisfied. An eddy viscosity coefficient, computed according to the algebraic turbulence formulation of Baldwin and Lomax, simulates the effects of turbulence. Author

N82-32310*# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering and Applied Mechanics.
THREE DIMENSIONAL FLOW MEASUREMENTS IN A TURBINE SCROLL
W. Tabakoff, B. V. R. Vittal, and B. Wood Jul. 1982 55 p refs
(Grant NAG3-26)
(NASA-CR-167920; NAS 1.26:167920) Avail: NTIS HC A04/MF A01 CSCL 01A

A study was conducted to determine experimentally the flow behavior in combined scroll nozzle assembly of a radial inflow turbine. Hot film anemometry technique was used to measure the three dimensional flow velocity in the scroll. The through flow and secondary flow velocity components are measured at various points in three scroll sections. Author

N82-32311*# Northrop Services, Inc., Huntsville, Ala.
SOLID ROCKET BOOSTER STING INTERFERENCE WIND TUNNEL TEST ANALYSIS, APPENDIX D
B. Conine and W. Boyle Aug. 1982 221 p refs
(Contract NAS8-33816)
(NASA-CR-162084; NAS 1.26:162082; TR-230-2042-A) Avail: NTIS HC A10/MF A01 CSCL 01A

Additional analyses of wind tunnel test results from SRB sting interference test TWT 660 and HRWT 042 were conducted to evaluate the sting interference that may be present in the Space Shuttle SRB reentry aerodynamic math model. Additional wind tunnel data was obtained at higher angles of attack from test program TWT 660 and test program HRWT 042. The additional data were analyzed to evaluate the procedures used to fair the data in the development of the SRB reentry aerodynamic data Tape no. 5. S.L.

N82-32312*# Pennsylvania State Univ., University Park. Dept. of Aerospace Engineering.
COMPUTER PREDICTION OF THREE-DIMENSIONAL POTENTIAL FLOW FIELDS IN WHICH AIRCRAFT PROPELLERS OPERATE M.S. Thesis
Stephen J. Jumper Aug. 1982 253 p refs
(Grant NsG-1308)
(NASA-CR-169317; NAS 1.26:169317) Avail: NTIS HC A12/MF A01 CSCL 01A

A computer program was developed to calculate the three dimensional, steady, incompressible, inviscid, irrotational flow field at the propeller plane (propeller removed) located upstream of an arbitrary airframe geometry. The program uses a horseshoe vortex of known strength to model the wing. All other airframe surfaces are modeled by a network source panels of unknown strength which is exposed to a uniform free stream and the wing-induced velocity field. By satisfying boundary conditions on each panel (the Neumann problem), relaxed boundary conditions being used on certain panels to simulate inlet inflow, the source strengths are determined. From the known source and wing vortex strengths, the resulting velocity fields on the airframe surface and at the propeller plane are obtained. All program equations are derived in detail, and a brief description of the program structure is presented. A user's manual which fully documents the program is cited. Computer predictions of the flow on the surface of a sphere and at a propeller plane upstream of the sphere are compared with the exact mathematical solutions. Agreement is good, and correct program operation is verified. Author

N82-32313*# Pennsylvania State Univ., University Park. Dept. of Aerospace Engineering.
THE DYNAMIC FLEXURAL RESPONSE OF PROPELLER BLADES M.S. Thesis
Slobodan Zivadin Djordjevic Nov. 1982 226 p refs Sponsored in part by NASA
(NASA-CR-169318; NAS 1.26:169318) Avail: NTIS HC A11/MF A01 CSCL 01A

The determination of the torsional constants of three blade models having NACA four-digit symmetrical airfoil cross sections is presented. Values were obtained for these models analytically and experimentally. Results were also obtained for three other models having rectangular, elliptical, and parabolic cross sections. Complete modal analyses were performed for five blade models. The identification of modal parameters was done for cases when the blades were modeled as either undampd or damped multi-degree-of-freedom systems. For the experimental phase of this study, the modal testing was performed using a Dual Channel FFT analyzer and an impact hammer (which produced an impulsive excitation). The natural frequency and damping of each mode in

the frequency range up to 2 kHz were measured. A small computer code was developed to calculate the dynamic response of the blade models for comparison with the experimental results. A comparison of the undamped and damped cases was made for all five blade models at the instant of maximum excitation force. The program was capable of handling models where the excitation forces were distributed arbitrarily along the length of the blade. Author

N82-32314*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN EXPERIMENTAL STUDY OF DYNAMIC STALL ON ADVANCED AIRFOIL SECTIONS. VOLUME 1: SUMMARY OF THE EXPERIMENT
W. J. McCroskey, K. W. McAlister, L. W. Carr, and S. L. Pucci Jul. 1982 102 p refs Prepared in cooperation with Army Aviation Research and Development Command, Moffett Field, Calif.
(NASA-TM-84245; A-8924; NAS 1.15:84245; USAAVRADCOM-TR-82-A-8) Avail: NTIS HC A06/MF A01 CSCL 01A

The static and dynamic characteristics of seven helicopter sections and a fixed-wing supercritical airfoil were investigated over a wide range of nominally two dimensional flow conditions, at Mach numbers up to 0.30 and Reynolds numbers up to 4 x 10 to the 6th power. Details of the experiment, estimates of measurement accuracy, and test conditions are described in this volume (the first of three volumes). Representative results are also presented and comparisons are made with data from other sources. The complete results for pressure distributions, forces, pitching moments, and boundary-layer separation and reattachment characteristics are available in graphical form in volumes 2 and 3. The results of the experiment show important differences between airfoils, which would otherwise tend to be masked by differences in wind tunnels, particularly in steady cases. All of the airfoils tested provide significant advantages over the conventional NACA 0012 profile. In general, however, the parameters of the unsteady motion appear to be more important than airfoil shape in determining the dynamic-stall airloads. Author

N82-32315*# Douglas Aircraft Co., Inc., Long Beach, Calif.
LONG DUCT NACELLE AERODYNAMIC DEVELOPMENT FOR DC-10 DERIVATIVES Final Report
S. P. Patel and J. E. Donelson Aug. 1980 29 p refs
(Contract NAS1-15327)
(NASA-CR-159271; NAS 1.26:159271; ACEE-17-FR-9005) Avail: NTIS HC A03/MF A01 CSCL 01A

The results are presented of a wind tunnel test utilizing a 4.7-percent-scale semispan model of the DC-10 in the Calspan 8-foot transonic wind tunnel. The effect of a revised long-duct nacelle shape on the channel velocities, the incremental drag relative to the baseline long-duct nacelle, and channel velocities for the baseline long-duct nacelle were determined and compared with data obtained at Ames. The baseline and the revised long-duct nacelles are representative of a CF6-50 mixed-flow configuration and were evaluated on a model of a proposed DC-10 stretched-fuselage configuration. The results showed that the revised long-duct nacelle has an appreciable effect on the inboard channel velocities, resulting in an increased channel Mach number. However, the pressure recovery on the nacelle afterbody was about the same for both nacelles. The lift curves for both long-duct nacelle configurations were the same. The channel pressures measured at Calspan were in good agreement with those measured at Ames for the baseline long-duct nacelle. The incremental drag for the revised nacelle was measured as two to four counts (three counts is approximately equal to one percent of the airplane drag) higher than that of the baseline long-duct nacelle. J.M.S.

N82-32316*# Boeing Commercial Airplane Co., Seattle, Wash.
REDUCTION OF COMPUTER USAGE COSTS IN PREDICTING UNSTEADY AERODYNAMIC LOADINGS CAUSED BY CONTROL SURFACE MOTION. ADDENDUM TO COMPUTER PROGRAM DESCRIPTION Final Report
W. S. Rowe and J. R. Petrarca Mar. 1980 51 p refs
(Contract NAS1-14122)
(NASA-CR-145354; NAS 1.26:145354) Avail: NTIS HC A04/MF A01 CSCL 01A

Changes to be made that provide increased accuracy and increased user flexibility in prediction of unsteady loadings caused by control surface motions are described. Analysis flexibility is increased by reducing the restrictions on the location of the downwash stations relative to the leading edge and the edges of the control surface boundaries. Analysis accuracy is increased in predicting unsteady loading for high Mach number analysis conditions through use of additional chordwise downwash stations. User guideline are presented to enlarge analysis capabilities of unusual wing control surface configurations. Comparative results indicate that the revised procedures provide accurate predictions of unsteady loadings as well as providing reductions of 40 to 75 percent in computer usage cost required by previous versions of this program. S.L.

N82-32317*# Boeing Commercial Airplane Co., Seattle, Wash.
REDUCTION OF COMPUTER USAGE COSTS IN PREDICTING UNSTEADY AERODYNAMIC LOADINGS CAUSED BY CONTROL SURFACE MOTIONS: COMPUTER PROGRAM DESCRIPTION Final Report
J. R. Petrarca, B. A. Harrison, M. C. Redman, and W. S. Rowe Jan. 1979 134 p refs
(Contract NAS1-14122)
(NASA-CR-158980; NAS 1.26:158980) Avail: NTIS HC A07/MF A01 CSCL 01A

A digital computer program was developed to calculate unsteady loadings caused by motions of lifting surfaces with leading edge and trailing edge controls based on the subsonic kernel function approach. The pressure singularities at hinge line and side edges were extracted analytically as a preliminary step to solving the integral equation of collocation. The program calculates generalized aerodynamic forces for user supplied deflection modes. Optional intermediate output includes pressure at an array of points, and sectional generalized forces. From one to six controls on the half span can be accommodated. Author

N82-32318*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A VECTORIZED CODE FOR CALCULATING LAMINAR AND TURBULENT HYPERSONIC FLOWS ABOUT BLUNT AXISYMMETRIC BODIES AT ZERO AND SMALL ANGLES OF ATTACK
Ajay Kumar (Old Dominion Univ.) and R. A. Graves, Jr. Jan. 1981 81 p refs
Avail: NTIS HC A05/MF A01 CSCL 01A

A user's guide is provided for a computer code which calculates the laminar and turbulent hypersonic flows about blunt axisymmetric bodies, such as spherically blunted cones, hyperboloids, etc., at zero and small angles of attack. The code is written in STAR FORTRAN language for the CDC-STAR-100 computer. Time-dependent, viscous-shock-layer-type equations are used to describe the flow field. These equations are solved by an explicit, two-step, time asymptotic, finite-difference method. For the turbulent flow, a two-layer, eddy-viscosity model is used. The code provides complete flow-field properties including shock location, surface pressure distribution, surface heating rates, and skin-friction coefficients. This report contains descriptions of the input and output, the listing of the program, and a sample flow-field solution. B.W.

N82-32319*# Douglas Aircraft Co., Inc., Long Beach, Calif.
INVESTIGATION OF THE INTERFERENCE EFFECTS OF MIXED FLOW LONG DUCT NACELLES ON A DC-10 WING Final Report
S. P. Patel and J. E. Donelson 19 Feb. 1982 68 p refs
(Contract NAS1-14743)
(NASA-CR-159202; NAS 1.26:159202; ACEE-05-FR-9845) Avail: NTIS HC A04/MF A01 CSCL 01A

Wind tunnel test results utilizing a 4.7 percent scale semispan model in the 11 foot transonic wind tunnel are presented. A low drag long duct nacelle installation for the DC-10 jet transport was

developed. A long duct nacelle representative of a CF6-50 mixed flow configuration was investigated on the DC-10-30. The results showed that the long duct nacelle installation located in the same position as the current short duct nacelle and with the current production symmetrical pylon is a relatively low risk installation for the DC-10 aircraft. Tuft observations and analytical boundary layer analysis confirmed that the flow on the nacelle afterbody was attached. A small pylon fairing was evaluated and found to reduce channel peak suction pressures, which resulted in a small drag improvement. The test also confirmed that the optimum nacelle incidence angle is the same as for the short duct nacelle, thus the same engine mount as for the production short duct nacelle can be used for the long duct nacelle installation. Comparison of the inboard wing pylon nacelle channel pressure distributions, with flow through and powered long duct nacelles showed that the power effects did not change the flow mechanism; hence, power effects can be considered negligible. S.L.

N82-32320*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

EFFECT OF NOZZLE AND VERTICAL-TAIL VARIABLES ON THE PERFORMANCE OF A 3-SURFACE F-15 MODEL AT TRANSONIC MACH NUMBERS

Odis C. Pendergraft, Jr. and E. Ann Bare Aug. 1982 171 p
(NASA-TP-2043; L-15304; NAS 1.60:2043) Avail: NTIS HC A08/MF A01 CSCL 01A

An investigation was conducted in the Langley 16 foot transonic tunnel to determine the longitudinal aerodynamic characteristics of twin two dimensional nozzles and twin baseline axisymmetric nozzles installed on a fully metric 0.047 scale model of the F-15 three surface configuration (canards, wing, horizontal tails). The effects on performance of two dimensional nozzle in flight thrust reversing, locations and orientation of the vertical tails, and deflections of the horizontal tails were also determined. Test data were obtained at static conditions and at Mach numbers from 0.60 to 1.20 over an angle of attack range from -2 deg to 15 deg. Nozzle pressure ratio was varied from jet off to about 6.5. Author

N82-32321*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

MEASURED PRESSURE DISTRIBUTIONS, AERODYNAMIC COEFFICIENTS AND SHOCK SHAPES ON BLUNT BODIES AT INCIDENCE IN HYPERSONIC AIR AND CF4

Charles G. Miller, III Sep. 1982 294 p refs
(NASA-TM-84489; L-15188; NAS 1.15:84489) Avail: NTIS HC A13/MF A01 CSCL 01A

Pressure distributions, aerodynamic coefficients, and shock shapes were measured on blunt bodies of revolution in Mach 6 CF4 and in Mach 6 and Mach 10 air. The angle of attack was varied from 0 deg to 20 deg in 4 deg increments. Configurations tested were a hyperboloid with an asymptotic angle of 45 deg, a sonic-corner paraboloid, a paraboloid with an angle of 27.6 deg at the base, a Viking aeroshell generated in a generalized orthogonal coordinate system, and a family of cones having a 45 deg half-angle with spherical, flattened, concave, and cusp nose shapes. Real-gas effects were simulated for the hyperboloid and paraboloid models at Mach 6 by testing at a normal-shock density ratio of 5.3 in air and 12 CF4. Predictions from simple theories and numerical flow field programs are compared with measurement. It is anticipated that the data presented in this report will be useful for verification of analytical methods for predicting hypersonic flow fields about blunt bodies at incidence. Author

N82-32322*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

EXPERIMENTAL INVESTIGATION OF TWO NONAXISYMMETRIC WEDGE NOZZLES AT FREE STREAM MACH NUMBERS UP TO 1.20

Mary L. Mason and William K. Abeyounis Sep. 1982 117 p refs
(NASA-TP-2054; L-15276; NAS 1.60:2054) Avail: NTIS HC A06/MF A01 CSCL 01A

Forces and pressures on two nonaxisymmetric wedge nozzles were measured in a 16 foot transonic tunnel. Tests were conducted at static conditions and at free stream Mach numbers of 0.60, 0.80, 0.90, 0.94, and 1.20. The range of nozzle pressure ratios varied with configuration and Mach number. The internal and external geometry of the nozzles and the test model are defined in detail. Nozzle performance data are presented as discharge coefficients, internal thrust ratios, thrust minus nozzle drag ratios, and ideal thrust coefficients. Extensive internal and external pressure measurements are presented. S.L.

N82-32323*# Georgia Inst. of Tech., Atlanta.

MEAN VELOCITIES AND REYNOLDS STRESSES IN A JUNCTURE FLOW Final Report

H. McMahon, J. Hubbartt, and L. Kubendran Washington NASA Aug. 1982 121 p refs
(Grant NAG1-40)
(NASA-CR-3605; NAS 1.26:3605) Avail: NTIS HC A06/MF A01 CSCL 01A

Values of three mean velocity components and six turbulence stresses measured in a juncture flow are presented and discussed. The juncture flow is generated by a constant thickness body, having an elliptical leading edge, which is mounted perpendicular to a large flat plate along which a turbulent boundary layer is growing. The measurements were carried out at two streamwise stations in the juncture and were made using two single sensor hot-wire probes. The secondary flow in the juncture results in a considerable distortion in the mean velocity profiles. The secondary flow also transports turbulence in the juncture flow and has a large effect on the turbulence stresses. From visual inspection of the results, there is considerable evidence of similarity between the turbulent shear stresses and the mean flow strain rates. There is some evidence of similarity between the variations in the turbulent stress components. S.L.

N82-32324 Royal Aircraft Establishment, Farnborough (England).

WAVE DRAG FROM OBLIQUE CROSS-SECTIONAL AREAS

J. Pike Jan. 1982 48 p refs
(RAE-TR-81155; RAE-Aero-3522; BR83415) Avail: NTIS HC A03/MF A01

A simple numerical method for estimating the oblique cross sectional areas of general body shapes is described together with the FORTRAN coding. When used with Eminton's method for evaluating the slender body wave drag integral, analytical slender body results are reproduced within 1%. The method was used to estimate the wave drag of cone cylinder bodies and smooth axisymmetric bodies for which the exact wave drag was known from the method of characteristics with a fitted bow shock wave. For cone cylinders with nose semiangles up to half the Mach angle, the estimates of the wave drag are within 5% of the exact values. For the smooth axisymmetric bodies, however, overestimates of 15% occur for nose semiangles equal of half the Mach angle. Author (ESA)

N82-32325# Naval Ship Research and Development Center, Bethesda, Md. Aviation and Surface Effects Dept.

TRANSONIC WIND TUNNEL TEST OF A 16 PERCENT THICK CIRCULATION CONTROL AIRFOIL WITH ONE PERCENT ASYMMETRIC CAMBER Final Report

Joseph B. Wilkerson and Peter S. Montana Apr. 1981 59 p refs
(W0578001)
(AD-A116298; DTNSRDC/ASED-82/03) Avail: NTIS HC A04/MF A01 CSCL 20/4

A two dimensional circulation control (CC) airfoil model was tested in the 7- by 10-foot transonic wind tunnel at the David W. Taylor Naval Ship R&D Center. Test conditions covered a range of free-stream Mach numbers (0.3 to 0.8), angles of attack (-10 to +6 deg), and blown jet pressure ratios (0 to 3.0). These data provided the first information on the influence of angle of attack on CC airfoil drag and lift augmentation at transonic speeds. The tested CC airfoil NCCR 1610-8054S was quasi-elliptical in shape, having a 16-percent thickness to chord ratio, with 1-percent maximum camber occurring at 70-percent chord. The program objectives were to achieve improved performance at transonic

speeds while maintaining the characteristically high-lift augmentation at low subsonic operation. These objectives required nonsymmetrical thickness and camber distributions for the airfoil. Performance goals were qualitatively substantiated by the transonic test data. At 2-deg angle of attack, a maximum lift coefficient of 2.1 was obtained at M free-stream Mach no. = 0.3; while for M free-stream Mach no. = 0.6 at the same angle, the maximum lift coefficient was 0.76. As a high-lift device the airfoil was very effective at and below M free-stream Mach no. = 0.4. As a means of direct lift control the airfoil remained effective up through M free-stream Mach no. = 0.7. Author (GRA)

N82-32326# European Space Agency, Paris (France).
TIME LINEARIZED CALCULATION OF TWO-DIMENSIONAL UNSTEADY TRANSONIC POTENTIAL FLOW AT SMALL DISTURBANCES
Ralph Voss Mar. 1982 59 p refs Transl. into ENGLISH of "Zeitlinearisierte Berechnung der Zweidimensionalen Instationaeren Transsonischen Potentialstroemung bei Kleinen Stoerungen" rept. DFVLR-FB-81-01 DFVLR, Goettingen, West Ger., Oct. 1980 87 p
(ESA-TT-728; DFVLR-FB-81-01) Avail: NTIS HC A04/MF A01; original German version available from DFVLR, Cologne DM 20

An integral equation method for the calculation of unsteady transonic flow fields around oscillating airfoils at small disturbances is investigated. The procedure is based on separating the velocity potential into steady and unsteady parts and linearizing the resulting unsteady differential equation assuming that harmonic oscillations are of small amplitude. Use of Green's theorem results in two coupled integral equations for a doublet distribution at the profile and a source distribution in the whole flow field. The equations are discretized on a finite area, neglecting far field influences, and solved by iteration. The influences of discretization and limitation of the field are shown by results for a NACA 64A 006 profile. Author (ESA)

N82-32327# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Abteilung Verduennte/Reale Gase.
FREE MOLECULAR AERODYNAMICS FOR SATELLITE APPLICATIONS Thesis - Goettingen Univ., West Germany
Georg Koppenwallner Feb. 1982 152 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-776)
(DFVLR-FB-82-08; ESA-TT-776) Avail: NTIS HC A08/MF A01; DFVLR, Cologne DM 38

The free molecular flow theory for convex and concave satellite elements was studied. The physical and theoretical flow behavior was investigated and simplified solutions for limiting cases were developed. For typical bodies and body elements the aerodynamic coefficients were calculated by exact and approximate solutions. Author (ESA)

N82-32328# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
A MULTIGRID ALGORITHM FOR STEADY TRANSONIC POTENTIAL FLOWS AROUND AIRFOILS, USING NEWTON ITERATION
J. W. Boerstoel 21 Aug. 1981 25 p refs Presented at Symp. on Multigrid Meth., Moffett Field, Calif., Oct. 1981
(Contract NIVR-1853)
(NLR-MP-81050-U) Avail: NTIS HC A02/MF A01

The application of multigrid relaxation to transonic potential flow calculation was investigated. It is shown that the iteration to the circulation must be kept outside the multigrid algorithm. In order to obtain meaningful norms of residuals (to be used in termination tests of loops), difference formulas with asymptotic scaling were introduced. Nonlinear instability problems were solved by upwind differencing using mass-flux-vector splitting instead of artificial viscosity or artificial density. The multigrid method cannot efficiently update shock positions due to the linear character of individual multigrid relaxation cycles. For subsonic flows, the algorithm is quite efficient. For transonic flows, the algorithm is robust. Author (ESA)

N82-32302# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.
TRANSONIC BLADE FLUTTER: A SURVEY OF NEW DEVELOPMENTS
M. F. Platzer *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 7 Jul. 1982 p 3-8 refs (For primary document see N82-32301 23-01)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01A

N82-32304# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
WIND EXCITED BEHAVIOUR OF STRUCTURES 3
D. J. Johns *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 7 Jul. 1982 p 23-38 refs (For primary document see N82-32301 23-01)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01A

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

No abstracts in this category.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N82-32329# National Severe Storms Lab., Norman, Okla.
CONSIDERATIONS FOR OPTIMUM SITING OF NEXRAD TO DETECT CONVECTIVE PHENOMENA HAZARDOUS TO TERMINAL AIR NAVIGATION, PART 1 Final Report, Oct. 1980 - Feb. 1982
P. R. Mahapatra, D. S. Zrnic, and R. J. Doviak May 1982 38 p refs
(Contract DTFA01-81-Y-10521)
(DOT/FAA/RD-82/56; RT0000) Avail: NTIS HC A03/MF A01

The number of aircraft accidents during terminal flight in which weather is the cause or a contributing factor, and the possibility of dedicated and detailed surveillance of hazardous weather in the terminal airspace were studied. Considerations for choosing a site for a next generation weather radar (NEXRAD) installation to fulfill this role in an optimum manner. It is shown that the detection of low level wind shear without precipitation imposes the most severe constraints on NEXRAD siting. Three general siting areas are considered: (1) within the airport area, (2) within the terminal area, but outside the airport area, (3) outside the terminal area. When a single NEXRAD radar must cover all hazardous phenomena over the terminal area, siting within the airport area appears to be the best choice. Under certain conditions, a case exists for siting the NEXRAD outside the terminal area.
Author

N82-32330# Lincoln Lab., Mass. Inst. of Tech., Lexington.
L-BAND DME MULTIPATH ENVIRONMENT IN THE MICROWAVE

LANDING SYSTEM (MLS) APPROACH AND LANDING REGION
James E. Evans 13 Apr. 1982 265 p refs
(Contracts F19628-80-C-0002; DOT-FA74WAI-461)
(FAA-RD-82/19; ATC-116) Avail: NTIS HC A12/MF A01

The multipath environment in the approach and landing region represents an important factor in the optimization and ultimate performance of the Microwave Landing System (MLS) Precision Distance Measuring Equipment (DME/P). Various types of multipath are assessed in the context of the proposed DME/P implementation error characteristics to ascertain the principal challenges. It is shown (analytically and experimentally) that specular reflections from buildings represents a significant challenge, particularly at low altitudes (e.g., category 2 decision height and below) where terrain lobing can cause the effective multipath levels to exceed the effective direct signal level. However, the time delay discrimination capabilities of the proposed DME/P should effectively eliminate the bulk of such multipath. Limited S-band (3 GHz) measurements of diffuse reflections from nominally flat terrain indicated very low levels. However, specular reflections from bare, hilly terrain may present problems in some cases. Author

N82-32331# Federal Aviation Administration, Atlantic City, N.J. Technical Center.
TERMINAL INFORMATION PROCESSING SYSTEM (TIPS) CONSOLIDATED CAB DISPLAY (CCD) COMPARATIVE ANALYSIS Final Report, Sep. 1979 - 1980
Loni Czekalski Apr. 1982 84 p refs
(FAA Proj. 219-151-120)
(FAA-CT-81-8) Avail: NTIS HC A05/MF A01

The air traffic control (ATC) users requirements are outlined. The Terminal Information Processing System (TIPS) and the consolidated cab display (CCD) were analyzed for ATC requirements, system engineering, conceptual differences and similarities, central processors, software, and central processing system cost. The Federal Aviation Administration (FAA) requests in specification form, vendor responses to the specifications and the recommendation which include flight data management in the CCD System are presented. E.A.K.

N82-32332# Department of Defense, Washington, D. C.
FEDERAL RADIONAVIGATION PLAN. VOLUME 1: RADIONAVIGATION PLANS AND POLICY Final Report, Jul. 1980 - Feb. 1982
Mar. 1982 80 p Prepared jointly with DOT 4 Vol.
(AD-A116468; DOD-4650.4-P-1; DOT-TSC-RSPA-81-12-1) Avail: NTIS HC A05/MF A01 CSCL 17/7

The second edition of the Federal Radionavigation Plan (FRP) has been jointly developed by the U.S. Departments of Defense and Transportation to ensure efficient use of resources and full protection of national interests. The plan sets forth the Federal interagency approach to the implementation and operation of radionavigation systems. The Federal Radionavigation Plan delineates policies and plans for Government provided radionavigation services. The Document describes respective areas to authority and responsibility, and provides a management structure by which the individual operating agencies will define requirements and meet them in a cost effective manner. It replaces the DOT National Plan for Navigation, and incorporates those sections of the DOD Joint Chiefs of Staff (JCS) Master Navigation Plan dealing with common user systems. Volume 1 is a summary document which delineates plans, policies, and authority and responsibility for providing radionavigation services. An integrated management plan describing how DOT and DOD will determine requirements and coordinated research, development, and implementation of radionavigation systems is provided in this volume. This plan will be updated annually, and is presently made up of a total of four volumes: Volume 2, Requirements; Volume 3, Radionavigation System Characteristics; and Volume 4, Radionavigation Research, Engineering and Development. GRA

N82-32333# Department of Defense, Washington, D. C.
FEDERAL RADIONAVIGATION PLAN. VOLUME 2: REQUIREMENTS Final Report, Jul. 1980 - Feb. 1982
Mar. 1982 48 p 4 Vol.
(AD-A116469; DOD-4650.4-P-2; DOT-TSC-RSPA-81-12-2) Avail: NTIS HC A03/MF A01 CSCL 17/7

Volume 2 is devoted to the user requirements (civil and military) and the processes for determining them. Both general and specific requirements related to various applications and phases of navigation are discussed. Present and future anticipated needs are also addressed. The requirements of civil and military users defined in Volume 2 for radio-navigational services are based upon the technical and operational performance needed for military missions, transportation safety, and economic efficiency. GRA

N82-32334# Department of Defense, Washington, D. C.
FEDERAL RADIONAVIGATION PLAN. VOLUME 3: RADIONAVIGATION SYSTEM CHARACTERISTICS Final Report, Jul. 1980 - Feb. 1982
Mar. 1982 48 p Prepared jointly with DOT 4 Vol.
(AD-A116470; DOD-4650.4-P-3; DOT-TSC-RSPA-81-12-3) Avail: NTIS HC A03/MF A01 CSCL 17/7

Volume 3 describes present and planned navigation systems in terms of nine major parameters: signal characteristics, accuracy, availability, coverage, reliability, fix rate, fix dimensions, capacity, and ambiguity. The volume addresses the characteristics, capabilities, and limitations of existing and proposed major radionavigation systems. All of the systems considered are defined in terms of system performance parameters which determine the utilization and limitations of the individual navigation system. GRA

N82-32335# Department of Defense, Washington, D. C.
FEDERAL RADIONAVIGATION PLAN. VOLUME 4: RADIONAVIGATION RESEARCH, ENGINEERING AND DEVELOPMENT Final Report, Jul. 1980 - Feb. 1982
Mar. 1982 32 p Prepared jointly with DOT 4 Vol.
(AD-A116471; DOD-4650.4-P-4; DOT-TSC-RSPA-81-12-4) Avail: NTIS HC A03/MF A01 CSCL 17/7

Volume 4 is a summary of the Federal Radionavigation R, E&D plan together with individual R, E&D plans for military and civil air, land, and marine applications. Open issues, and means for their resolution, are addressed. A key feature is a discussion on how the individual agency R, E&D plans will be coordinated to help assure that all aspects of each system are thoroughly evaluated while avoiding duplication of activities. GRA

N82-32336# IIT Research Inst., Annapolis, Md.
IMPACT OF AN OMNIDIRECTIONAL TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM ON THE AIR TRAFFIC CONTROL RADAR BEACON SYSTEM AND THE DISCRETE ADDRESS BEACON SYSTEM Final Report
G. Patrick and T. Keech Nov. 1981 39 p refs
(Contracts F19628-80-C-0042; DOT-FA70WAI-175; AF Proj. 649E)
(AD-A116170; ECAC-PR-81-018; DOT/FAA/RD-81/106) Avail: NTIS HC A03/MF A01 CSCL 17/7

A computer analysis was conducted to investigate the effect of an omnidirectional version of the Traffic Alert and Collision Avoidance System (TCAS) on the performance of: (1) the Air Traffic Control Radar Beacon System (ATCRBS), and (2) the planned Discrete Address Beacon System (DABS) in selected air traffic environments. The performance of ATCRBS and DABS was examined both with and without the TCAS in operation. Additional simulations were conducted to quantify the effect of TCAS when employing its interference-limiting function. Author (GRA)

N82-32337# Elliott-Automation Space and Advanced Military Systems Ltd., Frimley (England).
THE DEVELOPMENT OF TERRAIN FOLLOWING DISPLAYS FOR THE TORNADO AIRCRAFT
G. A. Ward and J. M. Davies 1982 20 p Presented at Ergonomics Res. Soc. Symp., 1982
(Rept-200) Avail: NTIS HC A02/MF A01

The development of a display which indicates terrain following equipment performance to the pilot and allows him to watch for external threats, such as towers or electronic countermeasures, is described. Display simulation was used in conjunction with flight

tests. Airborne video recording and ground replay equipment refreshed the memory of aircrew to transient display phenomena noticed in flight and provided an analysis and training record. A mathematical model, validated against photographs of in-flight events correlated by time and feature, enabled development approaches to be assessed prior to commitment to flight trials. In addition to exercising display design, the facility enabled sensor related phenomena to be checked out in more detail, e.g. failure cases and warning mechanization were assessed. Author (ESA)

N82-32338# European Space Agency, Paris (France).
ANALYSIS OF TWO AIR TRAFFIC SAMPLES IN THE FRANKFURT/MAIN AIRPORT TERMINAL AREA, AUGUST 4, 1978
Uwe Voelckers, Manfred Schubert, and Albrecht Seyfried May 1982 115 p refs Transl. into ENGLISH of "Anal. von zwei Verkehrsablaeufen im Anflugbereich Frankfurt/Main vom 4, Aug. 1978" rept. DFVLR-Mitt-81-12 DFVLR, Brunswick, Jun. 1981 127 p
(ESA-TT-739; DFVLR-Mitt-81-12) Avail: NTIS HC A06/MF A01; original German version available from DFVLR, Cologne DM 28

In order to investigate traffic flow and ATC strategies under peak load conditions, two surveys were carried out in the approach control area. When a receptive strategy was adopted, i.e., little control exerted over the acceptance rates, a slight reduction in the scatter of the distribution of arrivals at the pickup is noted, compared with a regulative strategy. Fewer holding procedures at the outer stacks, a higher average number of aircraft within the control area and on the extended runway centerline, and the need for holds at the inner stacks also result. The ensuing higher traffic density in the approach control area created difficult initial conditions for sequence planning. Control is affected more by the working techniques of individual controllers than by traffic flow. Author (ESA)

N82-32339# European Space Agency, Paris (France).
ANALYSIS OF TWO AIR TRAFFIC SAMPLES IN THE FRANKFURT/MAIN AIRPORT TERMINAL AREA, AUGUST 3, 1979
Manfred Schubert and Uwe Voelckers Jun. 1982 103 p refs Transl. into ENGLISH of "Analyse von zwei Verkehrsablaeufen im Anflugbereich Frankfurt/Main vom 3, Aug. 1979" rept. DFVLR-Mitt-81-17 DFVLR, Brunswick, Jun. 1981 117 p
(ESA-TT-740; DFVLR-Mitt-81-17) Avail: NTIS HC A06/MF A01; original German version available from DFVLR, Cologne DM 26,50

The effects of ATC strategies on arrival distributions, traffic handling, traffic sequence, and traffic density were analyzed, and compared with an analysis of approach traffic. In both sampling periods, traffic flow planning was mainly regulative, i.e., required delays were obtained in the en route region, by individual control or by holding. No instances of receptive control are reported. Holding was necessary at peak periods because alternatives, e.g., accelerating individual approaches in order to fill gaps, are too difficult to coordinate. Three techniques of movement guidance in controller's first instruction are noted: course planning fixes the shortest possible flight path, extended if necessary; course planning fixes a mean flight path, not adjusted until within the intermediate approach area; or course planning is initially in the form of delays. In the intermediate approach area, adjustments are made by accelerations. Author (ESA)

N82-32340# Miller Communications Systems Ltd., Kanata (Ontario).
PRELIMINARY STUDY OF AN AEROMARITIME NAVIGATION SYSTEM MAKING USE OF SATELLITES
B. A. Mazur, E. Wong, and R. Mamen Paris ESA Feb. 1982 378 p refs 2 Vol.
(Contract ESTEC-4631/81/F-RD(SC))
(MCS-8137-Vol-1; ESA-CR(P)-1601-Vol-1) Avail: NTIS HC A17/MF A01

The technical and performance characteristics, and ground station costs of a civilian satellite navigation system similar to the Global Positioning System (GPS) were evaluated. Simple transponding satellites coupled with continously transmitting ground stations are proposed. The annual worldwide costs for popular terrestrial radio navigation aids were estimated. The GPS constellation of 24 satellites in three 55 deg inclined circular orbits at 19,652 km altitude was found to represent a good tradeoff between the number of stations and satellites required against launch cost. With this baseline choice, four stations are sufficient and position dilution of precision does not exceed 3.4 worldwide. Relative vertical navigation uncertainties under 50 ft are achievable by 2 users employing single frequency navigation sets which incorporate a NAVSTAR type ionosphere model. Author (ESA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N82-32341*# Sikorsky Aircraft, Stratford, Conn.
RSRA VERTICAL DRAG TEST REPORT
R. J. Flemming Dec. 1981 91 p refs
(Contract NAS2-11058)
(NASA-CR-166399; NAS 1.26:166399; SER-72052) Avail: NTIS HC A05/MF A01 CSCL 01C

The Rotor Systems Research Aircraft (RSRA), because of its ability to measure rotor loads, was used to conduct an experiment to determine vertical drag, tail rotor blockage, and thrust augmentation as affected by ground clearance and flight velocity. The RSRA was flown in the helicopter configuration at speeds from 0 to 15 knots for wheel heights from 5 to 150 feet, and to 60 knots out of ground effect. The vertical drag trends in hover, predicted by theory and shown in model tests, were generally confirmed. The OGE hover vertical drag is 4.0 percent, 1.1 percent greater than predicted. The vertical drag decreases rapidly as wheel height is reduced, and is zero at a wheel height of 6 feet. The vertical drag also decreases with forward speed, approaching zero at sixty knots. The test data show the effect of wheel height and forward speed on thrust, gross weight capability, and power, and provide the relationships for power and collective pitch at constant gross weight required for the simulation of helicopter takeoffs and landings. Author

N82-32342*# Stanford Univ., Calif. Joint Inst. for Aeronautics and Acoustics.
AEROELASTIC STABILITY OF ROTOR BLADES USING FINITE ELEMENT ANALYSIS
Inderjit Chopra and Nithia Sivaneri Aug. 1982 119 p refs
(Contract NCC2-13)
(NASA-CR-166389; NAS 1.26:166389) Avail: NTIS HC A06/MF A01 CSCL 01C

The flutter stability of flap bending, lead-lag bending, and torsion of helicopter rotor blades in hover is investigated using a finite element formulation based on Hamilton's principle. The blade is divided into a number of finite elements. Quasi-steady strip theory is used to evaluate the aerodynamic loads. The nonlinear equations of motion are solved for steady-state blade deflections through an iterative procedure. The equations of motion are linearized assuming blade motion to be a small perturbation about the steady deflected shape. The normal mode method based on the coupled rotating natural modes is used to reduce the number of equations in the flutter analysis. First the formulation is applied to single-load-path blades (articulated and hingeless blades). Numerical results show very good agreement with existing results obtained using the modal approach. The second part of the application concerns multiple-load-path blades, i.e. bearingless blades. Numerical results are presented for several analytical models of the bearingless blade. Results are also obtained using an equivalent beam approach wherein a bearingless blade is modelled as a single beam with equivalent properties. Results show the equivalent beam model. Author

N82-32343*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

STATIC INVESTIGATION OF THE CIRCULATION CONTROL WING/UPPER SURFACE BLOWING CONCEPT APPLIED TO THE QUIET SHORT HAUL RESEARCH AIRCRAFT

J. C. Eppel, M. D. Shovlin, D. N. Jaynes, R. J. Englar (Naval Ship Research and Development Center, Bethesda, Md.), and J. H. Nichols, Jr. (Naval Ship Research and Development Center, Bethesda, Md.) Jul. 1982 49 p refs

(NASA-TM-84232; A-8883; NAS 1.15:84232) Avail: NTIS HC A03/MF A01 CSCL 01C

Full scale static investigations were conducted on the Quiet Short Haul Research Aircraft (QSRA) to determine the thrust deflecting capabilities of the circulation control wing/upper surface blowing (CCW/USB) concept. This scheme, which combines favorable characteristics of both the A-6/CCW and QSRA, employs the flow entrainment properties of CCW to pneumatically deflect engine thrust in lieu of the mechanical USB flap system. Results show that the no moving parts blown system produced static thrust deflections in the range of 40 deg to 97 deg (depending on thrust level) with a CCW pressure of 208,900 Pa (30.3 psig). In addition, the ability to vary horizontal forces from thrust to drag while maintaining a constant vertical (or lift) value was demonstrated by varying the blowing pressure. The versatility of the CCW/USB system, if applied to a STOL aircraft, was confirmed, where rapid conversion from a high drag approach mode to a thrust recovering waveoff or takeoff configuration could be achieved by nearly instantaneous blowing pressure variation. Author

N82-32344*# Lockheed-Georgia Co., Marietta.

MULTIBODY AIRCRAFT STUDY, VOLUME 1 Final Contractor Report, Sep. 1979 - Sep. 1981

J. W. Moore, E. P. Craven, B. T. Farmer, J. F. Honrath, R. E. Stephens, C. E. Bronson, Jr., R. T. Meyer, and J. H. Hogue Jul. 1982 238 p refs 2 Vol.

(Contract NAS1-15927)

(NASA-CR-165829-Vol-1; NAS 1.26:165829-Vol-1; LG81ER0259-Vol-1) Avail: NTIS HC A11/MF A01 CSCL 01C

The potential benefits of a multibody aircraft when compared to a single body aircraft are presented. The analyses consist principally of a detailed point design analysis of three multibody and one single body aircraft, based on a selected payload of 350,000 kg (771,618 lb), for final aircraft definitions; sensitivity studies to evaluate the effects of variations in payload, wing semispan body locations, and fuel price; recommendations as to the research and technology requirements needed to validate the multibody concept. Two, two body, one, three body, and one single body aircraft were finalized for the selected payload, with DOC being the prime figure of merit. When compared to the single body, the multibody aircraft showed a reduction in DOC by as much as 11.3 percent. Operating weight was reduced up to 14 percent, and fly away cost reductions ranged from 8.6 to 13.4 percent. Weight reduction, hence cost, of the multibody aircraft resulted primarily from the wing bending relief afforded by the bodies being located outboard on the wing. Author

N82-32345*# Lockheed-Georgia Co., Marietta.

MULTIBODY AIRCRAFT STUDY, VOLUME 2 Contractor Report, Sep. 1979 - Sep. 1981

J. W. Moore, E. P. Craven, B. T. Farmer, J. F. Honrath, R. E. Stephens, C. E. Bronson, Jr., R. T. Meyer, and J. G. Hogue Dec. 1981 230 p refs 2 Vol.

(Contract NAS1-15927)

(NASA-CR-165829-Vol-2; NAS 1.26:165829-Vol-2; LG81ER0259-Vol-2) Avail: NTIS HC A10/MF A01 CSCL 01C

The potential benefits of a multibody aircraft when compared to a single body aircraft are presented. The analyses consist principally of a detailed point design analysis of three multibody and one single body aircraft, based on a selected payload of 350,000 kg (771,618 lb), for final aircraft definitions; sensitivity studies to evaluate the effects of variations in payload, wing semispan body locations, and fuel price; recommendations as to the research and technology requirements needed to validate the multibody concept. Two, two body, one, three body, and one single body aircraft were finalized for the selected payload, with DOC being the prime figure of merit. When compared to the single body, the multibody aircraft showed a reduction in DOC by as much as 11.3 percent. Operating weight was reduced up to 14 percent, and fly away cost reductions ranged from 8.6 to 13.4 percent. Weight reduction, hence cost, of the multibody aircraft resulted primarily from the wing bending relief afforded by the bodies being located outboard on the wing. Author

N82-32346*# Boeing Commercial Airplane Co., Seattle, Wash.

SELECTED ADVANCED AERODYNAMICS AND ACTIVE CONTROLS TECHNOLOGY CONCEPTS DEVELOPMENT ON A DERIVATIVE B-747 Final Report, May 1977 - May 1979

Washington NASA Jul. 1980 301 p refs

(Contract NAS1-14741)

(NASA-CR-3164; NAS 1.26:3164; D6-48664) Avail: NTIS HC A14/MF A01 CSCL 01C

The feasibility of applying wing tip extensions, winglets, and active control wing load alleviation to the Boeing 747 is investigated. Winglet aerodynamic design methods and high speed wind tunnel test results of winglets and of symmetrically deflected ailerons are presented. Structural resizing analyses to determine weight and aeroelastic twist increments for all the concepts and flutter model test results for the wing with winglets are included. Control law development, system mechanization/reliability studies, and aileron balance tab trade studies for active wing load alleviation systems are discussed. Results are presented in the form of incremental effects on L/D, structural weight, block fuel savings, stability and control, airplane price, and airline operating economics. S.L.

N82-32347*# Douglas Aircraft Co., Inc., Long Beach, Calif.

SELECTED WINGLET AND MIXED FLOW LONG DUCT NACELLE DEVELOPMENT FOR DC-10 DERIVATIVE AIRCRAFT Final Summary Report

A. B. Taylor Washington NASA Jun. 1980 42 p refs

(NASA-CR-3296; NAS 1.26:3296; ACEE-05-FR-9912) Avail: NTIS HC A03/MF A01 CSCL 01C

The high speed cruise drag effects of the installation of winglets and a wing tip extension and a mixed flow long duct nacelle are investigated. The winglet program utilized a 4.7 percent semispan model in an eight foot transonic wind tunnel. Winglets provided approximately twice the cruise drag reduction of wing tip extensions for about the same increase in bending moment at the wing-fuselage juncture. The long duct nacelle interference drag program utilized the same model, without the winglets, in the 11 foot transonic wind tunnel. The long duct nacelle, installed in the same position as the current short duct nacelle and with the current production symmetric pylon, was a relatively low risk installation. A pylon with an addition small rearward fairing was also tested and showed some drag reduction potential over the current pylon. S.L.

N82-32348*# Douglas Aircraft Co., Inc., Long Beach, Calif.

APPLICATION OF AN OPTIMIZED WINGLET CONFIGURATION TO AN ADVANCED COMMERCIAL TRANSPORT

C. A. Shollenberger Nov. 1979 82 p refs Revised

(Contract NAS1-14744)

(NASA-CR-159156; NAS 1.26:159156; ACEE-06-FR-9661-Rev) Avail: NTIS HC A05/MF A01 CSCL 01C

The design is presented of an aircraft which employs an integrated wing and winglet lift system. Comparison was made with a conventional baseline configuration employing a high-aspect-ratio supercritical wing. An optimized wing-winglet combination was selected from four proposed configurations for which aerodynamic, structural, and weight characteristics were evaluated. Each candidate wing-winglet configuration was constrained to the same induced drag coefficient as the baseline aircraft. The selected wing-winglet configuration was resized for a specific medium-range mission requirement, and operating costs were estimated for a typical mission. Study results indicated that the wing-winglet aircraft was lighter and could complete the specified mission at less cost

than the conventional wing aircraft. These indications were sensitive to the impact of flutter characteristics and, to a lesser extent, to the performance of the high-lift system. Further study in these areas is recommended to reduce uncertainty in future development. Author

N82-32349*# Boeing Commercial Airplane Co., Seattle, Wash. Preliminary Design Dept.
INTEGRATED APPLICATION OF ACTIVE CONTROLS (IAAC) TECHNOLOGY TO AN ADVANCED SUBSONIC TRANSPORT PROJECT. INITIAL ACT CONFIGURATION DESIGN STUDY Summary Report, Aug. 1978 - Sep. 1979
Washington NASA Oct. 1980 40 p refs
(Contracts NAS1-14742; NAS1-15325)
(NASA-CR-3304; NAS 1.26:3304; D6-48671) Avail: NTIS HC A03/MF A01 CSCL 01C

The initial ACT configuration design task of the integrated application of active controls (IAAC) technology project within the Energy Efficient Transport Program is summarized. A constrained application of active controls technology (ACT) resulted in significant improvements over a conventional baseline configuration previously established. The configuration uses the same levels of technology, takeoff gross weight, payload, and design requirements/objectives as the baseline, except for flying qualities, flutter, and ACT. The baseline wing is moved forward 1.68 m. The configuration incorporates pitch-augmented stability (which enabled an approximately 10% aft shift in cruise center of gravity and a 45% reduction in horizontal tail size), lateral/directional-augmented stability, an angle of attack limiter, wing load alleviation, and flutter mode control. This resulted in a 930 kg reduction in airplane operating empty weight and a 3.6% improvement in cruise efficiency, yielding a 13% range increase. Adjusted to the 3590 km baseline mission range, this amounts to 6% block fuel reduction and a 15.7% higher incremental return on investment, using 1978 dollars and fuel cost. S.L.

N82-32350*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOME DESIGN CONSIDERATIONS FOR SOLAR-POWERED AIRCRAFT
William H. Phillips Jun. 1980 60 p refs
(NASA-TP-1675; L-13562; NAS 1.60:1675) Avail: NTIS HC A04/MF A01 CSCL 01C

Performance and operating characteristics are presented for a solar powered aircraft intended to remain aloft for long periods. The critical technologies which limit the performance are identified. By using the techniques presented, the effects of variation in the system parameters are studied. Practical design consideration are discussed. S.L.

N82-32351# Simmonds Precision Products, Inc., Vergennes, Vermont. Instrument Systems Div.
COMMERCIAL AIRCRAFT AIRFRAME FUEL SYSTEMS SURVEY AND ANALYSIS Final Report, Oct. 1980 - Jun. 1982
P. G. Weitz Atlantic City, N.J. FAA Jul. 1982 98 p refs
(Contract DTFA03-80-C-0080)
(DOT/FAA/CT-82/80; Rept-181-320-100) Avail: NTIS HC A05/MF A01

A selection of commercial aircraft airframe fuel systems was studied to determine areas where incompatibility with antimisting kerosene fuel (AMK) may exist. Incompatibility can be due to reduced fuel system component performance with AMK or shear degradation of the AMK by the fuel system components. Survey results, to date, indicate that potential component performance problems with AMK are more significant than loss of AMK flammability protection due to shear degradation. Components of interest include ejector pumps, fuel filters, and auxiliary power units. Author

N82-32352# Operations Research, Inc., Silver Spring, Md.
AIRCRAFT ENERGY CONSERVATION DURING AIRPORT GROUND OPERATIONS Final Report
J. Bauchspies, F. Costello, J. Felder, J. Thompson, and H. Hilliard
Washington FAA Mar. 1982 313 p
(Contract DTFA01-80-C-10132)
(AD-A116138; FAA-EE-82-8; ORI-TR-1974) Avail: NTIS HC A14/MF A01 CSCL 01/2

This study identifies and assesses potential fuel conservation options which are available for use during ground operations at Dulles International (IAD) and Washington National (DCA) airports. The study also identifies and analyzes ground operations fuel savings options which have been considered and/or implemented by the various airlines operating at IAD and/or DCA since 1971. In addition, an evaluation of computer models which could be used for analyzing these fuel conservation options at other airports is included. The impact of socio/economic factors such as safety, environment, limitation on expansion and restrictions on accommodating forecast activity at DCA and IAD were considered during the analysis of each option. Author (GRA)

N82-32353# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
MINI-RPV ROCKET LAUNCH TESTS Final Report, Oct. 1980 - Mar. 1982
James L. Koury May 1982 69 p
(AF Proj. 3148)
(AD-A116293; AFRPL-TR-82-05) Avail: NTIS HC A04/MF A01 CSCL 01/3

This report covers the mini-RPV launch tests conducted at the AFRPL. The rocket motor development program conducted by ARC provided 13 booster motors, five of which were used in the launch tests. The mini-RPVs were launched to a velocity of 65 miles per hour from an aluminum rail or varying lengths (22, 14, 7 and 0 feet), using a nozzleless solid rocket booster. The final test demonstrated the capability of launching the mini-RPV from a platform. Author (GRA)

N82-32354# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
AIRBORNE FLIGHT TEST SYSTEM (AFTS) Final Report
John A. Maynard 26 Oct. 1982 84 p
(Contract F33615-76-C-1002)
(AD-A115100; SD-TR-82-2) Avail: NTIS HC A05/MF A01 CSCL 17/2

A full 1000 Mbps laser communications system transmitting from an aircraft to a ground station receiver was demonstrated. The system was designed around spaceborne terminal requirements and included prototype operational components. A spaceborne high data rate transmitter was designed, the space platform design was adapted to operate on a KC-135 aircraft, development and fabrication of both the ground based receiver terminal, and the airborne transmitter were developed and fabricated. GRA

N82-32355# Army Aviation Engineering Flight Activity, Edwards AFB, Calif. Directorate of Development and Qualification.
CLIMATIC LABORATORY EVALUATION YCH-47D HELICOPTER Final Report, 9 Sep. - 22 Oct. 1980
John R. Niemann, Charles F. Adam, and Jerry A. Brown Aug. 1981 222 p refs
(AD-A115861; USAAEFA-79-13) Avail: NTIS HC A10/MF A01 CSCL 01/3

The United States Army Aviation Engineering Flight Activity conducted a climatic laboratory evaluation of the Boeing Vertol YCH-47D helicopter. Approximately 17-1/2 hours of aircraft operating time and 22 test runs were required to complete the test. The YCH-47D systems, subsystems and components were evaluated at stabilized temperatures ranging from -65 F to +125 F. In some cases, inconclusive results were obtained at the colder temperatures because the test was conducted without rotor blades. The foremost of which are the apparent inability of the flight control hydraulic fluid to warm sufficiently for flight and the pilot's inability to neutralize the flight controls prior to engine start. The YCH-47D performed acceptably from -25 F to 125 F and exhibited potential for operation at a temperature of -50 F. Two deficiencies were identified: (1) failure of the engine control lever to control the engine during start because of excess moisture in the cockpit; and (2) the erratic operation of the hydraulic power transfer units

at -50 F. A total of 14 shortcomings were also identified. Further engineering testing below -25 F with rotor blades installed is recommended to determine if the hydraulic fluid temperature can be increased and maintained in flight at a level that would provide satisfactory flight control response and to evaluate the use of MIL-H-5606 hydraulic fluid at the lower temperatures. The operator's manual should specify a minimum temperature for aircraft operation. Author (GRA)

N82-32356# Naval Air Development Center, Warminster, Pa.
REPLACEMENT OF ABOARD NAVAL AIRCRAFT Progress Report
L. C. Fuller, K. G. Clark, and E. R. Wright 10 Nov. 1981 99 p refs
(AD-A115782; NADC-81080-60) Avail: NTIS HC A05/MF A01 CSCL 01/3

A program for replacing asbestos on Naval aircraft has been initiated. A survey to identify all asbestos-containing aircraft materials has been made. Many commercially available substitutes and their properties have been identified. Replacements will soon be available for MIL-A-7021 asbestos gasket material. Author (GRA)

N82-32357# Kuhn (Richard E.), Newport News, Va.
HIGH PRESSURE BLEED FOR STOL AND STO-VL PERFORMANCE: A CONCEPTUAL EXAMINATION Final Report
Richard E. Kuhn May 1982 54 p refs
(Contract N00167-81-M-3207)
(AD-A115762; DTNSRDC-82/032; DTNSRDC-AERO-1279) Avail: NTIS HC A04/MF A01 CSCL 01/2

The engines in modern combat aircraft are sized by combat maneuverability considerations. These aircraft therefore have much more thrust available than is needed at normal takeoff and landing speeds. Only the Harrier, which can vector the thrust of the centrally-mounted engine through the center of gravity can use its excess thrust to reduce the takeoff and landing distance (to zero at low operating weights). The engines on the others are too far aft for direct thrust vectoring. This paper examines other possibilities. The main emphasis is on the possibility of using bleed air from the high pressure compressor to blow the wing and/or a canard for STOL performance. Alternately, the use of this high pressure bleed to drive fold-out fans to achieve STO-VL performance is also examined. Author (GRA)

N82-32358# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Dept. of Electrical Engineering.
ERROR PROTECTION OF STORES MANAGEMENT SYSTEM DATA TRANSFERS M.S. Thesis
Paul F. Miller Dec. 1981 147 p refs
(AD-A115494; AFIT/GE/EE/81D-41) Avail: NTIS HC A07/MF A01 CSCL 17/2

Stores management systems are being converted from analog control to digital control. The DOD has chosen the MIL-STD-1553B multiplexed digital data bus as the communication channel for the digital stores management system. There is insufficient error protection inherent in MIL-STD-1553B to ensure reliable transfer of critical commands. The possible methods of improving the performance of the system within the constraints of MIL-STD-1553B are examined. To achieve better performance (measured in probability of error and throughput), a combination of channel codes and specific transmission schemes are evaluated. Word error rates and block (message) error rates are calculated for each coding scheme. The block error rates are then used to determine the performance of each specific coding scheme-transmission scheme pair. Finally, the coding scheme-transmission scheme pairs are compared for probability of error and throughput. Author

N82-32359# Aeronautical Research Labs., Melbourne (Australia). Aerodynamics Div.
DATA REDUCTION PROCEDURES FOR SEA KING HELICOPTER FLIGHT TRIALS
N. E. Gilbert May 1982 58 p refs
(AD-A117044; AERO-TM-338; AR-002-884) Avail: NTIS HC A04/MF A01 CSCL 09/2

The data reduction procedures used in obtaining fully processed data from raw flight data for trials on a Sea King Mk. 50 helicopter are given. The procedures allow various corrections and calibrations to be applied, removal of noise, and calculation of many additional quantities, some of which are used for kinematic consistency checking purposes. Examples are provided on the running of the various computer programs developed. To assist in the use of the data for validation of the Sea King mathematical model, output is obtained in a form allowing ready comparison between trials and model results on the same graphs. Author (GRA)

N82-32360# European Space Agency, Paris (France).
AN ANALYTICAL STUDY OF LANDING FLARE
Guenther Knorr and Knut Wilhelm Jun. 1982 61 p refs Transl. into ENGLISH of "Ein Beitrag zur anal. Beschreibung des Abfangvorgangs" rept. DFVLR-FB-79-40 DFVLR, Brunswick, Sep. 1979 76 p
(ESA-TT-656; DFVLR-FB-79-40) Avail: NTIS HC A04/MF A01; original German version available from DFVLR, Cologne DM 15,20

Landing flare is described, taking into account the aircraft eigen dynamics. Analytical solutions are given for the time history of the state variables in flare, using a simple control law. Conventional flare, flare with direct lift control, and flare with coupled control movements of elevator and flap are described. The effect of wind shear is investigated. The solution functions are evaluated taking an airliner as example. A tolerance range for flare initiation is defined. Author (ESA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N82-32361 Elliott-Automation Space and Advanced Military Systems Ltd., Frimley (England).
AVIONIC SYSTEM DEVELOPMENT FOR THE TORNADO F MK2
P. H. T. Horrox 1981 8 p Presented at Marconi 81 Symp., 23 Jun. 1981
(Rept-96) Avail: NTIS HC A02

The development of the Air Defence Variant (ADV) avionics system is sketched. The functions of the system design, software, test and trials, system support, and project control teams are outlined. Target sequencing software, an algorithm for combat environment navigation, and a data link which gives users access to targets tracked by other radars are discussed. A test rig in which a real time computer model of the ADV can be flown by a stick and throttle or by a simulation of the autopilot, is described. Author (ESA)

N82-32362*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DESIGN OF ANALYTICAL FAILURE DETECTION USING SECONDARY OBSERVERS
M. Sisar Aug. 1982 49 p refs
(NASA-TM-84284; NAS 1.15:84284) Avail: NTIS HC A03/MF A01 CSCL 01D

The problem of designing analytical failure-detection systems (FDS) for sensors and actuators, using observers, is addressed. The use of observers in FDS is related to the examination of the n-dimensional observer error vector which carries the necessary information on possible failures. The problem is that in practical systems, in which only some of the components of the state vector are measured, one has access only to the m-dimensional observer-output error vector, with $m < \text{or} = \text{to}$ n. In order to cope with these cases, a secondary observer is synthesized to reconstruct the entire observer-error vector from the observer

output error vector. This approach leads toward the design of highly sensitive and reliable FDS, with the possibility of obtaining a unique fingerprint for every possible failure. In order to keep the observer's (or Kalman filter) false-alarm rate under a certain specified value, it is necessary to have an acceptable matching between the observer (or Kalman filter) models and the system parameters. A previously developed adaptive observer algorithm is used to maintain the desired system-observer model matching, despite initial mismatching or system parameter variations. Conditions for convergence for the adaptive process are obtained, leading to a simple adaptive law (algorithm) with the possibility of an a priori choice of fixed adaptive gains. Simulation results show good tracking performance with small observer output errors, while accurate and fast parameter identification, in both deterministic and stochastic cases, is obtained. Author

N82-32363*# Ohio Univ., Athens. Avionics Engineering Center.
EFFICIENT TRANSFER OF WEATHER INFORMATION TO THE PILOT IN FLIGHT Final Summary Report
Richard H. McFarland Hampton, Va. NASA. Langley Research Center Apr. 1982 24 p refs
(Grant NAG1-124)
(NASA-CR-165889; NAS 1.26:165889) Avail: NTIS HC A02/MF A01 CSCL 05H

Efficient methods for providing weather information to the pilot in flight are summarized. Use of discrete communications channels in the aeronautical, VHF band or subcarriers in the VOR navigation band are considered the best possibilities. Data rates can be provided such that inputs to the ground based transmitters from 2400 band telephone lines are easily accommodated together with additional data. The crucial weather data considered for uplinking are identified as radar reflectivity patterns relating to precipitation, spherics data, hourly sequences, nowcasts, forecasts, cloud top heights with freezing and icing conditions, the critical weather map and satellite maps. NEXRAD, the ground based, Doppler weather radar which will produce an improved weather product also encourages use of an uplink to fully utilize its capability to improve air safety. S.L.

N82-32364# Technology, Inc., Dayton, Ohio.
DEVELOPMENT OF A STRUCTURAL INTEGRITY RECORDING SYSTEM (SIRS) FOR US ARMY AH-1S HELICOPTERS Final Report, Aug. 1981 - May 1982
James G. Dotson and Axel W. Kolb Fort Eustis, Va. Army Research and Technology Labs. May 1982 128 p refs
(Contract DAAK51-81-C-0035; DA Proj. 1L1-62209-AH-76)
(AD-A116027; USAAVRADCOM-TR-82-D-8) Avail: NTIS HC A07/MF A01 CSCL 01/4

A follow-on research and development program to implement a Structural Integrity Recording System (SIRS) for the Army AH-1S helicopter was conducted by developing a computer program to reduce recorded aircraft usage data. The program, titled Fatigue Damage Assessment System (FDAS), was designed to run on the AVRADCOM computer. An improved lift-link-mounted strain sensor was also developed. The sensor was laboratory-tested and deemed ready for follow-on application testing in regard to monitoring helicopter gross weight, and take-off and landing detection. Author (GRA)

N82-32365# Smiths Industries, Inc., Clearwater, Fla. Aerospace and Defense Systems Div.
RELIABILITY AND MAINTAINABILITY IMPROVEMENT PROGRAM FOR THE AV-8A/TAV-8A HARRIER HEAD-UP DISPLAY SET, DEVELOPMENT OF THE SIGNAL DATA CONVERTER, CV-3600/AVQ-30(V), VOLUME 3 Final Engineering Report
M. D. Carmichael 20 Sep. 1982 16 p 3 Vol.
(Contract N00019-77-A-0350)
(AD-A115554; SI-1010-Vol-3; NADC-78080-60-Vol-3) Avail: NTIS HC A02/MF A01 CSCL 14/2

The circuitry driving the head-up display in the AV-8A aircraft, called the Waveform Generator, was revised and updated to improve reliability. The new unit, called the Signal Data Converter, provides greater capability, built-in test features, phosphor protection circuits, reduced size and weight, and greater adaptability to changed input or output requirements. Author (GRA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N82-32366* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ACTIVE CLEARANCE CONTROL SYSTEM FOR A TURBOMACHINE Patent
Richard P. Johnston, Malcolm H. Knapp, and Charles E. Coulson, inventors (to NASA) Issued 11 May 1982 6 p Filed 25 Jul. 1979
(NASA-Case-LEW-12938-1; US-Patent-4,329,114;
US-Patent-Appl-SN-060449; US-Patent-Class-415-145;
US-Patent-Class-415-178; US-Patent-Class-60-726;
US-Patent-Class-60-39.29; US-Patent-Class-60-39.07) Avail: US Patent and Trademark Office CSCL 21E

An axial compressor is provided with a cooling air manifold surrounding a portion of the shroud, and means for bleeding air from the compressor to the manifold for selectively flowing it in a modulating manner axially along the outer side of the stator/shroud to cool and shrink it during steady state operating conditions so as to obtain minimum shroud/rotor clearance conditions. Provision is also made to selectively divert the flow of cooling air from the manifold during transient periods of operation so as to alter the thermal growth or shrink rate of the stator/shroud and result in adequate clearance with the compressor rotor.
Official Gazette of the U.S. Patent and Trademark Office

N82-32367*# Avco Lycoming Div., Stratford, Conn.
SMALL AXIAL TURBINE STATOR TECHNOLOGY PROGRAM Final Report
W. Brockett and A. Kozak Apr. 1982 89 p refs
(Contract NAS3-22109; DA Proj. 1L1-62209-AH-76)
(NASA-CR-165602; NAS 1.26:165602; LYC-82-15) Avail: NTIS HC A05/MF A01 CSCL 21E

An experimental investigation was conducted to determine the effects of surface finish, fillet radius, inlet boundary layer thickness, and free-stream inlet turbulence level on the aerodynamic performance of a small axial flow turbine stator. The principal objective of this program was to help understand why large turbine efficiency is not maintained when a large turbine is scaled to a smaller size. The stator used in this program as a one-sixth scale of a 762 mm (30 in.) diameter stator design with 50 vanes having a vane height of 17 mm (0.666 in.) and an aspect ratio of 1.77. A comprehensive overall test matrix was used to provide a complete engineering understanding of the effects of each variable over the full range of all the other variables. The range of each variable investigated was as follows: surface finish 0.1 micro (4 micro in.) to 2.4 micro (95 micro in.); boundary layer thickness 2 to 25 percent of channel height at each wall; fillet radius 0 mm (0 in.) to 1.0 mm (.040 in.) and turbulence 2 to 12 percent. Author

N82-32368*# Systems Control, Inc., Palo Alto, Calif.
DEVELOPMENT OF A ROTORCRAFT. PROPULSION DYNAMICS INTERFACE ANALYSIS, VOLUME 1 Final Report
Russell Hull Aug. 1982 147 p refs 2 Vol.
(Contract NAS2-10765)
(NASA-CR-166380; NAS 1.26:166380) Avail: NTIS HC A07/MF A01 CSCL 21E

The details of the modeling process and its implementation approach are presented. A generic methodology and model structure for performing coupled propulsion/rotor response analysis

that is applicable to a variety of rotorcraft types was developed. A method for parameterizing the model structure to represent a particular rotorcraft is defined. The generic modeling methodology, the development of the propulsion system and the rotor/fuselage models, and the formulation of the resulting coupled rotor/propulsion system model are described. A test case that was developed is described. J.D.

N82-32369*# Systems Control, Inc., Palo Alto, Calif.
DEVELOPMENT OF A ROTORCRAFT. PROPULSION DYNAMICS INTERFACE ANALYSIS, VOLUME 2 Final Report
Russell Hull Aug. 1982 56 p refs 2 Vol.
(Contract NAS2-10765)
(NASA-CR-166381; NAS 1.26:166381) Avail: NTIS HC A04/MF A01 CSCL 21E

A study was conducted to establish a coupled rotor/propulsion analysis that would be applicable to a wide range of rotorcraft systems. The effort included the following tasks: (1) development of a model structure suitable for simulating a wide range of rotorcraft configurations; (2) defined a methodology for parameterizing the model structure to represent a particular rotorcraft; (3) constructing a nonlinear coupled rotor/propulsion model as a test case to use in analyzing coupled system dynamics; and (4) an attempt to develop a mostly linear coupled model derived from the complete nonlinear simulations. Documentation of the computer models developed is presented. J.M.S.

N82-32370*# Lockheed-Georgia Co., Marietta.
ADVANCED TURBOPROP TESTBED SYSTEMS STUDY. VOLUME 1: TESTBED PROGRAM OBJECTIVES AND PRIORITIES, DRIVE SYSTEM AND AIRCRAFT DESIGN STUDIES, EVALUATION AND RECOMMENDATIONS AND WIND TUNNEL TEST PLANS
E. S. Bradley, B. H. Little, W. Warnock, C. M. Jenness, J. M. Wilson, C. W. Powell, and L. Shoaf Cleveland, Ohio NASA. Lewis Research Center Jul. 1982 368 p refs 2 Vol.
(Contract NAS3-22346)
(NASA-CR-167928-Vol-1; NAS 1.26:167928-Vol-1; LG81ER0202-Vol-1) Avail: NTIS HC A16/MF A01 CSCL 21E

The establishment of propfan technology readiness was determined and candidate drive systems for propfan application were identified. Candidate testbed aircraft were investigated for testbed aircraft suitability and four aircraft selected as possible propfan testbed vehicles. An evaluation of the four candidates was performed and the Boeing KC-135A and the Gulfstream American Gulfstream II recommended as the most suitable aircraft for test application. Conceptual designs of the two recommended aircraft were performed and cost and schedule data for the entire testbed program were generated. The program total cost was estimated and a wind tunnel program cost and schedule is generated in support of the testbed program. E.A.K.

N82-32371# Cairo Univ. (Egypt). Center for Combustion.
SPRAY MODELLING FOR MULTIFUEL ENGINES Annual Technical Report, Apr. 1980 - Apr. 1981
M. M. Elkotb Jul. 1982 206 p refs
(Grant DA-ERO-79-G-0017; DA PROJ. 1T1-61102-BH-57)
(AD-A116818; ATR-2) Avail: NTIS HC A10/MF A01 CSCL 21/5

Contents: Mathematical Modeling of Flow in Swirl Chambers of Multifuel Engines; Experimental Setup and Measuring Technique; Presentation and Discussion of Air Flow Field Results; Fuel Spray Modelling; Atomization of Multifuel. GRA

N82-32372# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
COMPUTATION OF THREE DIMENSIONAL UNSTEADY NONUNIFORM FLOW IN THE BLADE-FREE ANNULAR CHANNEL OF A TURBOMACHINE
Pierre Bry and Pierre Laval 1982 49 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-779)
(ONERA-NT-1982-2; ESA-TT-779) Avail: NTIS HC A03/MF A01

A numerical method of solution for three dimensional, inviscid, nonuniform, either sub or supersonic flows is presented. A time splitting explicit difference method (disintegration method) with shorter computing times than an explicit classical finite difference method is used. The results illustrate severe inlet total pressure distortion level with or without swirling inlet flow, particularly the modification of the three dimensional flow pattern in the cylindrical channel due to the effects of inlet swirl and total pressure distortion. Author (ESA)

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N82-32373* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DECOUPLER PYLON: WING/STORE FLUTTER SUPPRESSOR Patent
Wilmer H. Reed, III, inventor (to NASA) Issued 10 Aug. 1982 9 p Filed 28 Mar. 1980 Supersedes N80-22359 (18 - 13, p 1673)
(NASA-Case-LAR-12468-1; US-Patent-4,343,447; US-Patent-Appl-SN-135057; US-Patent-Class-244-137R; US-Patent-Class-244-118.1; US-Patent-Class-89-1.5G) Avail: US Patent and Trademark Office CSCL 01C

A device for suspending a store from a support such as an aircraft wing and more specifically for increasing the flutter speed of an aircraft flying with attached store and reducing the sensitivity of flutter to changes in the pitch inertia and center of gravity location of the store is described. It comprises softspring where the store pitch mode is decoupled from support modes and a low frequency active control mechanism which maintains store alignment. A pneumatic suspension system both isolates the store in pitch and, under conditions of changing mean load, aligns the store with the wing to which it is attached.
Official Gazette of the U.S. Patent and Trademark Office

N82-32374*# Boeing Vertol Co., Philadelphia, Pa.
MATH MODELING FOR HELICOPTER SIMULATION OF LOW SPEED, LOW ALTITUDE AND STEEPLY DESCENDING FLIGHT Final Report, Jun. 1981 - Jun. 1982
Philip F. Sheridan, Carl Robinson, John Shaw, and Fred White Moffett Field, Calif. NASA. Ames Research Center Jul. 1982 70 p refs
(Contract NAS2-10975)
(NASA-CR-166385; NAS 1.26:166385) Avail: NTIS HC A04/MF A01 CSCL 01C

A math model was formulated to represent some of the aerodynamic effects of low speed, low altitude, and steeply descending flight. The formulation is intended to be consistent with the single rotor real time simulation model at NASA Ames Research Center. The effect of low speed, low altitude flight on main rotor downwash was obtained by assuming a uniform plus first harmonic inflow model and then by using wind tunnel data in the form of hub loads to solve for the inflow coefficients. The result was a set of tables for steady and first harmonic inflow coefficients as functions of ground proximity, angle of attack, and airspeed. The aerodynamics associated with steep descending flight in the vortex ring state were modeled by replacing the steady induced downwash derived from momentum theory with an experimentally derived value and by including a thrust fluctuations effect due to vortex shedding. Tables of the induced downwash and the magnitude of the thrust fluctuations were created as functions of angle of attack and airspeed. Author

N82-32375*# Information and Control Systems, Inc., Hampton, Va.
ACTIVE FLUTTER SUPPRESSION USING OPTICAL OUTPUT FEEDBACK DIGITAL CONTROLLERS

May 1982 79 p refs
(Contract NAS1-16772)
(NASA-CR-165939; NAS 1.26:165939) Avail: NTIS HC A05/MF A01 CSCL 01C

A method for synthesizing digital active flutter suppression controllers using the concept of optimal output feedback is presented. A convergent algorithm is employed to determine constrained control law parameters that minimize an infinite time discrete quadratic performance index. Low order compensator dynamics are included in the control law and the compensator parameters are computed along with the output feedback gain as part of the optimization process. An input noise adjustment procedure is used to improve the stability margins of the digital active flutter controller. Sample rate variation, prefilter pole variation, control structure variation and gain scheduling are discussed. A digital control law which accommodates computation delay can stabilize the wing with reasonable rms performance and adequate stability margins. S.L.

N82-32376*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TOWARD A BETTER UNDERSTANDING OF HELICOPTER STABILITY DERIVATIVES
Raymond S. Hansen Aug. 1982 26 p refs Prepared in cooperation with Army Research and Technology Labs., Moffett Field, Calif.
(NASA-TM-84277; NAS 1.15:84277; AVRADCOM-TR-82-A-12) Avail: NTIS HC A03/MF A01 CSCL 01C

An amended six degree of freedom helicopter stability and control derivative model was developed in which body acceleration and control rate derivatives were included in the Taylor series expansion. These additional derivatives were derived from consideration of the effects of the higher order rotor flapping dynamics, which are known to be inadequately represented in the conventional six degree of freedom, quasistatic stability derivative model. The amended model was a substantial improvement over the conventional model, effectively doubling the unsable bandwidth and providing a more accurate representation of the short period and cross axis characteristics. Further investigations assessed the applicability of the two stability derivative model structures for flight test parameter identification. Parameters were identified using simulation data generated from a higher order base line model having sixth order rotor tip path plane dynamics. Three lower order models were identified: one using the conventional stability derivative model structure, a second using the amended six degree of freedom model structure, and a third model having eight degrees of freedom that included a simplified rotor tip path plane tilt representation. S.L.

N82-32377*# Douglas Aircraft Co., Inc., Long Beach, Calif.
DEVELOPMENT OF A LOW RISK AUGMENTATION SYSTEM FOR AN ENERGY EFFICIENT TRANSPORT HAVING RELAXED STATIC STABILITY
T. R. Sizlo, R. A. Berg, and D. L. Gilles Dec. 1979 352 p refs Revised
(Contract NAS1-14744)
(NASA-CR-159166; NAS 1.26:159166; ACEE-06-FR-9679-Rev) Avail: NTIS HC A16/MF A01 CSCL 01C

An augmentation system for a 230 passenger, twin engine aircraft designed with a relaxation of conventional longitudinal static stability was developed. The design criteria are established and candidate augmentation system control laws and hardware architectures are formulated and evaluated with respect to reliability, flying qualities, and flight path tracking performance. The selected systems are shown to satisfy the interpreted regulatory safety and reliability requirements while maintaining the present DC 10 (study baseline) level of maintainability and reliability for the total flight control system. The impact of certification of the relaxed static stability augmentation concept is also estimated with regard to affected federal regulations, system validation plan, and typical development/installation costs. S.L.

N82-32378*# Boeing Commercial Airplane Co., Seattle, Wash. Product Assurance Unit.
THE B-747 FLIGHT CONTROL SYSTEM MAINTENANCE AND RELIABILITY DATA BASE FOR COST EFFECTIVENESS TRADE-OFF STUDIES Contractor Final Report, Nov. 1978 - Jan. 1980
Aug. 1982 200 p refs
(Contract NAS1-15588)
(NASA-CR-159275; NAS 1.26:159275; D6-46353) Avail: NTIS HC A09/MF A01 CSCL 01C

Primary and automatic flight controls are combined for a total flight control reliability and maintenance cost data base using information from two previous reports and additional cost data gathered from a major airline. A comparison of the current B-747 flight control system effects on reliability and operating cost with that of a B-747 designed for an active control wing load alleviation system is provided. Author

N82-32379*# Boeing Commercial Airplane Co., Seattle, Wash.
COST AND BENEFITS DESIGN OPTIMIZATION MODEL FOR FAULT TOLERANT FLIGHT CONTROL SYSTEMS Contractor Final Report, Sep. 1980
J. Rose Aug. 1982 251 p refs
(Contract NAS1-15506)
(NASA-CR-159281; NAS 1.26:159281; D6-46352) Avail: NTIS HC A12/MF A01 CSCL 01C

Requirements and specifications for a method of optimizing the design of fault-tolerant flight control systems are provided. Algorithms that could be used for developing new and modifying existing computer programs are also provided, with recommendations for follow-on work. Author

N82-32380*# Boeing Commercial Airplane Co., Seattle, Wash. Preliminary Design Dept.
INTEGRATIVE APPLICATION OF ACTIVE CONTROLS (IAAC) TECHNOLOGY TO AN ADVANCED SUBSONIC TRANSPORT PROJECT. INITIAL ACT CONFIGURATION DESIGN STUDY Final Report, Aug. 1978 - Sep. 1979
Jul. 1980 412 p refs
(Contracts NAS1-14742; NAS1-15325)
(NASA-CR-159249; NAS 1.26:159249; D6-48662) Avail: NTIS HC A18/MF A01 CSCL 01C

The performance and economic benefits of a constrained application of Active Controls Technology (ACT) are identified, and the approach to airplane design is established for subsequent steps leading to the development of a less constrained final ACT configuration. The active controls configurations are measured against a conventional baseline configuration, a state-of-the-art transport, to determine whether the performance and economic changes resulting from ACT merit proceeding with the project. The technology established by the conventional baseline configuration was held constant except for the addition of ACT. The wing, with the same planform, was moved forward on the initial ACT configuration to move the loading range aft relative to the wing mean aerodynamic chord. Wing trailing-edge surfaces and surface controls also were reconfigured for load alleviation and structural stabilization. J.M.S.

N82-32381*# Boeing Commercial Airplane Co., Seattle, Wash. Preliminary Design Dept.
INTEGRATED APPLICATION OF ACTIVE CONTROLS (IAAC) TECHNOLOGY TO AN ADVANCED SUBSONIC TRANSPORT PROJECT. CONVENTIONAL BASELINE CONFIGURATION STUDY Final Report
Jun. 1980 230 p refs
(Contracts NAS1-14742; NAS1-15325)
(NASA-CR-159248; NAS 1.26:159248; DE-48666-1) Avail: NTIS HC A11/MF A01 CSCL 01C

Characteristics of the U.S. domestic fleet were evaluated to determine the mission characteristics that would have the most impact on U. S. transport fuel use in the future. This resulted in selection of a 197-passenger (plus cargo), about 3710-km (2000 nmi) mission. The existing data base was reviewed and additional analysis was conducted as necessary to complete the

technical descriptions. The resulting baseline configuration utilizes a double-lobe, but nearly circular, body with seven-abreast seating. External characteristics feature an 8.71 aspect ratio, 31.5-degree sweep wing, a T-tail empennage, and a dual CF6-6D2, wing-mounted engine arrangement. It provides for 22 LD-2 or 11 LD-3 containers plus bulk cargo in the lower lobe. Passenger/cargo loading, servicing provisions, taxi/takeoff speeds, and field length characteristics are all compatible with accepted airline operations and regulatory provisions. The baseline configuration construction uses conventional aluminum structure except for advanced aluminum alloys and a limited amount of graphite epoxy secondary structure. Modern systems are used, including advanced guidance, navigation, and controls which emphasize application of digital electronics and advanced displays. J.M.S.

N82-32382*# Clemson Univ., S.C. Dept. of Mathematical Sciences.
INTEGRATED AIRFRAME PROPULSION CONTROL Contractor Report, Oct. 1980 - Apr. 1982
Robert E. Fennell and Stephen B. Black Aug. 1982 102 p
(Grant NAG1-81)
(NASA-CR-3606; NAS 1.26:3606) Avail: NTIS HC A06/MF A01 CSCL 01C

Perturbation equations which describe flight dynamics and engine operation about a given operating point are combined to form an integrated aircraft/propulsion system model. Included in the model are the dependence of aerodynamic coefficients upon atmospheric variables along with the dependence of engine variables upon flight condition and inlet performance. An off-design engine performance model is used to identify interaction parameters in the model. Inclusion of subsystem interaction effects introduces coupling between flight and propulsion variables. To analyze interaction effects on control, consideration is first given to control requirements for separate flight and engine models. For the separate airframe model, feedback control provides substantial improvement in short period damping. For the integrated system, feedback control compensates for the coupling present in the model and provides good overall system stability. However, this feedback control law involves many non-zero gains. Analysis of suboptimal control strategies indicates that performance of the closed loop integrated system can be maintained with a feedback matrix in which the number of non-zero gains is small relative to the number of components in the feedback matrix. Author

N82-32303# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
ACTIVE CONTROL TECHNOLOGY IN AIRCRAFT
D. McLean *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 7 Jul. 1982 p 11-22 refs (For primary document see N82-32301 23-01)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 01C

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N82-32383*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Energy Efficient Engine Component Development and Integration Program.
ENERGY EFFICIENT ENGINE: HIGH PRESSURE TURBINE UNCOOLED RIG TECHNOLOGY REPORT
W. B. Gardner Oct. 1979 242 p refs
(Contract NAS3-20646)
(NASA-CR-165149; NAS 1.26:165149; PWA-5594-92) Avail: NTIS HC A11/MF A01 CSCL 14B

Results obtained from testing five performance builds (three vane cascades and two rotating rigs of the Energy Efficient Engine uncooled rig have established the uncooled aerodynamic efficiency of the high-pressure turbine at 91.1 percent. This efficiency level was attained by increasing the rim speed and annulus area (AN(2)), and by increasing the turbine reaction level. The increase in AN(2) resulted in a performance improvement of 1.15 percent. At the design point pressure ratio, the increased reaction level rig demonstrated an efficiency of 91.1 percent. The results of this program have verified the aerodynamic design assumptions established for the Energy Efficient Engine high-pressure turbine component. Author

N82-32384*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPLICATION OF A TRANSONIC SIMILARITY RULE TO CORRECT THE EFFECTS OF SIDEWALL BOUNDARY LAYERS IN TWO-DIMENSIONAL TRANSONIC WIND TUNNELS M.S. Thesis - George Washington Univ.
William Grier Sewall Aug. 1982 91 p refs
(NASA-TM-84847; NAS 1.15:84847) Avail: NTIS HC A05/MF A01 CSCL 14B

A transonic similarity rule which accounts for the effects of attached sidewall boundary layers is presented and evaluated by comparison with the characteristics of airfoils tested in a two dimensional transonic tunnel with different sidewall boundary layer thicknesses. The rule appears valid provided the sidewall boundary layer both remains attached in the vicinity of the model and occupies a small enough fraction of the tunnel width to preserve sufficient two dimensionality in the tunnel. S.L.

N82-32385# National Physical Lab., Teddington (England). Div. of Quantum Metrology.
THE DESIGN OF A STANDARDS LABORATORY FOR THERMOMETRY
P. B. Coates May 1982 36 p refs
(NPL-QU-64; ISSN-0309-3050) Avail: NTIS HC A03/MF A01

The calibration of primary standard thermometers, secondary standards and other instruments for thermometry is discussed. Equipment and accommodation requirements are detailed. The dissemination of the international practical temperature scale is considered. Author (ESA)

N82-32386# Mission Research Corp., Alexandria, Va.
A-7 FLIGHT SOFTWARE ANALYSIS Final Report, 8 Aug. 1981 - 28 Feb. 1982
Bruce B. Amlicke and Joseph C. Fox Feb. 1982 62 p refs
(Contract N00014-81-C-2476)
(AD-A116179; MRC/WDC-R-018) Avail: NTIS HC A04/MF A01 CSCL 09/2

This document describes the development of Unitless Mathematical Models for on-board flight software. The development is part of the NRL Software Cost Reduction Program. A subset of the equations existing in the operational flight program were examined to determine existing units and basic assumptions. The equations were then rederived in unitless form with clearly stated assumptions; this is the form which is most useful to modular design. Author (GRA)

N82-32387# Defense Mapping Agency Aerospace Center, St. Louis, Mo.
SENSOR IMAGE SIMULATOR APPLICATION STUDIES Interim Report, Jun. 1981 - Apr. 1982
Marshall B. Faintich Apr. 1982 12 p refs
(AD-A116741) Avail: NTIS HC A02/MF A01 CSCL 09/2

The primary objective of the digital sensor simulation investigations being conducted at the Defense Mapping Agency (DMA) is to establish an editing and analysis capability for the digital culture and terrain data bases. These data bases are being produced by DMA to support advanced aircraft simulators by providing an improved high, medium, and low level radar training capability offered by the digitally generated radar landmass images. In addition to radar scenes, visual and multi-sensor scenes are being

digitally generated. For purposes of quality control and data base applicability investigations, DMA has developed the Sensor Image Simulator (SIS), a very high speed data base edit station and static scene simulator that allows for interactive query and manipulation of individual features in the data base displays and/or simulated sensor scenes to determine the corresponding data base elements responsible for the simulated features. GRA

N82-32388# Naval Air Development Center, Warminster, Pa.
USER'S GUIDE FOR THE ROTORCRAFT FLIGHT SIMULATION COMPUTER PROGRAM C81, AGAP80 VERSION, CDC CONVERSION Final Report
B. J. Gajkowski Mar. 1982 28 p refs
(AD-A115801; NADC-81290-60) Avail: NTIS HC A03/MF A01 CSCL 14/2

The current version of the Rotorcraft Flight Simulation Program C81, AGAP80, was installed in a CDC converted form on the CDC CYBER 175/CDC 6600 Computer System at NAVAIRDEVCEN. The problems encountered in validating this CDC conversion, using the TR-80-38A User's Manual sample case as a test case, are described. The program capabilities in the area of Flight Dynamics analysis are repeated as a quick guide to the user in order to maintain continuity with the USAAVRADCOM-TR-80-D-38A User's Manual. This report is not meant to supersede TR-80-D-38-A. An effort is made throughout the description of the program capabilities to provide the user with a description of the inputs required to perform that particular program operation and the output data that resulted. The user is referred to the TR-80-D-38A User's Manual for the information necessary for assembling a complete input data deck and to successfully execute the program. There were two program operation problems identified while running test cases on this CDC conversion of the AGAP80 version. These two were the inability to perform any of the postprocessing operations of GDAP80 and the inability to compute eigenvalues in the rotorcraft stability analysis. The cost of running this program at NAVAIRDEVCEN to perform a trimmed flight analysis, a rotorcraft stability analysis, and a maneuver simulation is discussed. GRA

N82-32389# Naval Biodynamics Lab., New Orleans, La.
ATTRIBUTE REQUIREMENTS FOR A SIMULATED FLIGHT SCENARIO MICROCOMPUTER TEST
Richard H. Shannon, Michele Krause, and Richard C. Irons Jan. 1982 27 p refs
(AD-A115676; NBDL-82R004) Avail: NTIS HC A03/MF A01 CSCL 05/9

Eighteen subjects practiced a video game of bombing and air combat maneuvering, Phantoms Fiver, on an APPLE microcomputer for 10 minutes a day for 15 days. The dependent variable was the combined score for number of hits and number of targets. Performance stabilized from Days 8 - 15 with a pooled reliability of .904. Eight reference tests which theoretically measure cognitive, perceptual, quantitative, and motor skills were selected and used as independent variables. Stabilized performance on these tests was observed after a period of practice which was predetermined from previous experimentation. Attributes of the Phantoms Five were isolated using a structured job analytic tool (Position Analysis Questionnaire, PAQ). A principal components analysis of the measures that correlated with the dependent variable resulted in a one factor solution explaining 66 percent of the variance. GRA

N82-32390# Centre Technique des Industries Mecaniques, St. Etienne (France).
AUTOMATION OF A TEST BENCH FOR THE CHARACTERIZATION OF SHELF BRACKETS Final Report [AUTOMATISATION DU BANC D'ESSAIS DE CARACTERISATION DES ATTACHES DE CASIER]
J. P. Faurie, R. Tola, and G. Rouchouse Oct. 1981 16 p In FRENCH
(CETIM-5-512-04) Avail: NTIS HC A02/MF A01

A calculation method and test bench, specifically designed for the study of shelf brackets of the sort used in consumer outlets, are presented. Due to the high demand by manufacturers of brackets for the testing of their products, the test bench was automated. The test setup is described. Data analysis is explained. Extension of this method to the testing of heavy-duty industrial brackets is foreseen. Author (ESA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N82-32391# Netherlands Committee for Geophysics and Space Research, Amsterdam.
SPACE RESEARCH IN THE NETHERLANDS Annual Report, 1981
1981 86 p refs
Avail: NTIS HC A05/MF A01

The designing, building, testing, and operating of space scientific instruments is treated along with interpretation of data collected with these instruments. Innovations in technique and management, arising from this work, are considered for their impact on industry. Participation in the ESA program for microgravity research, including biological and materials science experiments based on Spacelab and sounding rocket flight opportunities, is summarized. Results obtained by scientific satellite instruments, by balloon-borne instruments, and by laser ranging of satellites for geodetical studies are set forth. Author (ESA)

N82-32392# European Space Agency, Paris (France).
THE ATLAS C MISSION
J. Puls, R. Naehle, A. Pietrass, H. P. Schmidt, and M. Schroeder May 1982 138 p refs Transl. into ENGLISH of "Die ATLAS-C-Mission" rept. DFVLR-FB-81-19 DFVLR, Oberpfaffenhofen, West Ger., Jun. 1981 130 p
(ESA-TT-735; DFVLR-FB-81-19) Avail: NTIS HC A07/MF A01; original German version available from DFVLR, Cologne DM 21,30

A mission in which a metric camera takes high resolution pictures of the Earth for cartography is proposed. The African continent is taken as an example. Because the storage life of conventional film material is 7 months, optimal orbits were selected for given ground coverage as a function of various focal lengths of the camera lens. The mission envisages using a space shuttle for the launch and retrieval of the autonomous satellite. The satellite is based on the concept of a small modular subsatellite and thruster platform. Author (ESA)

N82-32393# Technische Hochschule, Aachen (West Germany). Lehrgebeit Physikalische Chemie.
DEVELOPMENT OF AN EXPERIMENT TO MEASURE INTERDIFFUSION COEFFICIENTS IN MOLTEN SALTS AT LOW GRAVITY Final Report, Jan. 1981
Achim Hahne, Juergen Hermanns, and Joachim Richter Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 70 p refs In GERMAN; ENGLISH summary
(BMFT-FB-W-81-049; ISSN-0170-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14,70

A laboratory experiment was developed in order to measure interdiffusion coefficients in binary alkali nitrate silver nitrate melts. The setup was tested with aqueous KCl solutions. A polarization interferometer with the starting condition of a plane source was used for the measurements. Results show that the optical arrangement is suitable for use on board Spacelab. The design of a Spacelab experiment cell which allows measurement of diffusion coefficients without convection is presented. Author (ESA)

N82-32533*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEEP SPACE PAYLOAD LAUNCHES VIA THE SPACE TRANSPORTATION SYSTEM
A. L. Berman, W. E. Larkin, and J. C. McKinney *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 21-36

ref (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 22A

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N82-32394# National Bureau of Standards, Washington, D.C. Engineering Lab.
A GUARDED-HOT-PLATE APPARATUS FOR MEASURING EFFECTIVE THERMAL CONDUCTIVITY OF INSULATIONS BETWEEN 80 K AND 360 K
David R. Smith, Jerome G. Hust, and Lambert J. VanPoolen Jan. 1982 57 p refs Sponsored in part by DOE
(PB82-169921; NBSIR-81-1657) Avail: NTIS HC A04/MF A01 CSCL 14B

A guarded-hot-plate apparatus used to determine the effective thermal conductivity of glass fiber insulations is described. Measurements can be performed at temperatures from 80 K to 360 K, from atmospheric pressure to a vacuum of 0.0001 Pa (1 x 0.000001 torr). Various fill gases such as air, nitrogen, argon, and helium can be utilized. Overall uncertainties of thermal conductivities at atmospheric pressure are 1% at the higher temperatures and 5% at the lower cryogenic temperatures. The modifications of the commercial apparatus described in this report resulted in approximately a four-fold improvement in uncertainty. Author

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N82-32395*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
LAUNCH MISSION SUMMARY INTELSAT V (F5) ATLAS/CENTAUR-60
16 Sep. 1982 14 p
(NASA-TM-84846; KSC-GP-15-31; NAS 1.15:84846) Avail: NTIS HC A02/MF A01 CSCL 22A

The Atlas/Centaur 60 launch vehicle, INTELSAT V (F5) spacecraft, and mission are summarized. Also included is information relative to launch windows, flight plan, radar and telemetry coverage, selected trajectory information, and a brief sequence of flight events. Author

N82-32396# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
EVALUATION OF TERMINALLY GUIDED REENTRY VEHICLE EFFECTIVENESS AGAINST UNDEFENDED HARD TARGETS M.S. Thesis
Paul F. Auclair Mar. 1982 80 p refs
(AD-A115704; AFIT/GST/OS/82M-2) Avail: NTIS HC A05/MF A01 CSCL 22/2

This thesis examines the effectiveness of various reentry vehicle configurations when they are targeted against buried, hard targets. The configurations are based on the reentry vehicle parameters of yield and CEP as well as the number of reentry vehicles per missile. An examination of the ground shock and overpressure kill radii resulted in the use of overpressure as the hard target kill mechanism. The methodology developed to examine reentry vehicle effectiveness was programmed on a Hewlett-Packard HP-41CV. The methodology allows variations in CEP, weapon system reliability, weapon yield, and number of reentry vehicles per missile, and the desired kill level. The measure of effectiveness of each reentry vehicle configuration is the number of missiles required to achieve a desired kill level on a user defined target matrix. The results of the methodology were generalized with a set of exponential equations. Each equation is based on a desired kill level and a fixed number of reentry vehicles per missile. A sensitivity analysis on the various configurations revealed the relative impact of equal percentage changes in the factors used in this study. Author (GRA)

N82-32397# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A SIMULATION MODEL FOR ANALYZING REENTRY VEHICLE/ANTIBALLISTIC MISSILE ENGAGEMENTS M.S. Thesis
Carl L. Critchlow and Ronald C. Williams Mar. 1982 164 p refs
(AD-A115691; AFIT/GST/OS/82M-5) Avail: NTIS HC A08/MF A01 CSCL 15/3

The subject of this thesis is the system consisting of the engagements between attacking intercontinental ballistic missile (ICBM) reentry vehicles (RV) and a defending ballistic missile defense system. The thesis presents a brief overview of the actual system before proceeding with the development of a computer simulation model designed to aid analysis of the system. The primary language of the main program is SLAM; the supporting programs use FORTRAN V. The RV/Antiballistic missile (ABM) system is modeled as a network through which the RVs flow. The capabilities of the RV with regard to yield and accuracy can be set to the user's desires as can the vulnerabilities of the RV to the two primary kill mechanisms considered, X-ray and neutron radiation. The ABM system consists of a two-tiered, layered terminal defense system with high altitude (70,000 - 150,000 feet) and low altitude (10,000 - 70,000 feet) interceptors. Interceptor yield and accuracy are changeable. Either layer can be activated or deactivated, singly or together, to permit flexibility in the comparison of actual of hypothetical systems. GRA

N82-32398# Ogden Air Logistics Center, Hill AFB, Utah. Missile System Management Div.
TITAN 2 RELIABILITY AND AGING SURVEILLANCE PROGRAM (RASP)
J. M. Littleton 5 Feb. 1982 45 p
(AD-A115604; RASP-ETR-25) Avail: NTIS HC A03/MF A01 CSCL 16/4

This report provides the results of RASP Phase I and Phase IA testing as completed for Missile Airborne and Ground Support Systems. The Phase I testing is conducted in conjunction with the missile recycle and removal of the engines for testing under the Service Life Analysis Program (SLAP), and includes special and critical testing of all airborne and ground support equipment for aging trends. Phase IA testing does not involve Recycle, SLAP Testing or Downloading of Propellants, but includes testing of all critical airborne and support equipment for launch readiness verification, aging trends, logistic support, special testing or inspection requirements. The data collected during RASP testing are reduced, analyzed and applied to the Titan II Weapon System Mathematical Model to produce estimates of system reliability. The actual system reliability estimates obtained are reported in the OO-ALC System Effectiveness Report (RCS LOG-MM(Q) 7372). GRA

N82-32399# Lincoln Lab., Mass. Inst. of Tech., Lexington.
OPTIMAL SEARCH THEORY AND OPTICAL ARTIFICIAL SATEL-

LITE SEARCHES
L. G. Taff 5 May 1982 27 p refs
(Contract F19628-80-C-0002; AF Proj. 3221; AF Proj. 2698)
(AD-A115617; ETS-64; ESD-TR-82-042) Avail: NTIS HC A03/MF A01 CSCL 22/3

This report discusses the along orbit search, by optical means, for an artificial satellite. In particular the attempt is made to couch the search in the existing scenario of optimal search theory. This cannot be done for existing and envisaged searches. The reasons for this are explored and some new concepts of optimality are discussed for real searches. The point is made that both hardware and software adjustments would be necessary in order to reconfigure optical searches for artificial satellites so that search theory can be utilized. Author (GRA)

N82-32400# Societe Europeenne de Propulsion, Vernon (France). Dept. Espace.
FIELD EMISSION ELECTRIC PROPULSION POWER CONDITIONING UNIT DESIGN CONCEPT, VOLUME 1 Final Report
A. Gasparini (Fabrica Italiano Apparecchi Radio S.p.A.), F. Devambez, and D. Valentian Paris ESA 1981 183 p 2 Vol.
(Contract ESTEC-3983/79/NL-AK)
(SEP-TS/SL/340/DV/30-063/80-V1; ESA-CR(P)-1556-Vol-1) Avail: NTIS HC A09/MF A01

The requirements for auxiliary and primary propulsion systems were investigated in order to define the requirements for the field emission electric propulsion power conditioning unit (PCU). Emphasis was placed on simplifying the PCU design and improving weight. The PCU consists of a central power and control module (CPCM) connected to several thruster dedicated power supply modules (TDPDM). The connections between the CPCM and the TDPDM the command and control philosophy, and the power cmponents and power circuits are considered. The use of high inverter frequencies and optical fiber data transmission to aleviate high voltage insulation problems are addressed. J.M.S.

N82-32401# Societe Europeenne de Propulsion, Vernon (France). Dept. Espace.
FIELD EMISSION ELECTRIC PROPULSION POWER CONDITIONING UNIT DESIGN CONCEPT, VOLUME 2 Final Report
A. Gasparini (Fabrica Italiano Apparecchi Radio S.p.A.), F. Devambez, and D. Valentian Paris ESA 1981 133 p refs 2 Vol.
(Contract ESTEC-3983/79/NL-AK)
(SEP-TS/SL/340/DV/30-063/80-V2; ESA-CR(P)-1556-Vol-2) Avail: NTIS HC A07/MF A01

The requirements for a power conditioning unit (PCU) for a field emission thruster system are discussed. Specifically, the emitter power supply system, thermal control and structural aspects, and the frozen PCU architecture are addressed. In addition, a PCU development program is presented. Results indicate that inverters can be operated at 50 KHz and that a single transformer is sufficient to provide beam power. An optical fiber link between the central control unit and the thruster dedicated power module is feasible and allows fast binary exchange between units. Weight improvement with respect to a classical solution is nearly 50%. J.M.S.

N82-32402# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Div. Systemes Balistiques et Spatiaux.
FUTURE LAUNCHING SYSTEMS Final Report
M. Villain Paris ESA 9 Jun. 1981 71 p
(Contract ESA-4406/80/F-FC)
(SYT/L3-21-554; ESA-CR(P)-1599) Avail: NTIS HC A04/MF A01

A space launcher that is recoverable was studied. Possible configurations were investigated and dimensioning parameters were identified. Analysis centered on design of a two-stage vehicle in a winged or ballistic configuration. The launch vehicle mission was defined as injection into low Earth orbit of a 10,000 kg payload. Results concern choice of propulsion system as well as ascent and descent trajectories (including implications for thermal protection). Author (ESA)

N82-32403# Applied Systems Studies, Coventry (England).
APPLICATION OF LINEAR ANALYTIC SYSTEMS THEORY TO ATTITUDE CONTROL
P. E. Crouch and N. Carmichael Paris ESA Nov. 1981 110 p refs Prepared in coperation with Rome Univ., Italy
(Contract ESTEC-3771/78/NL-AK(SC))
(ESA-CR(P)-1600) Avail: NTIS HC A06/MF A01

An algorithm for real time implementation of nonlinear control techniques, and decoupling methods are discussed. The algorithm stabilizes a system with gas jet actuators yielding two control torques only, and uses the theory of control variations to develop higher order directions. The decoupling techniques generalize to nonlinear systems. The linear geometric techniques, using static and dynamic state or output feedback, which can remove the effect of noisy inputs from selected outputs, create unique channels of influence from input to output. Author (ESA)

N82-32404# National Aerospace Lab., Amsterdam (Netherlands). Spaceflight Div.
EXPERIMENTAL AND SYSTEMS STUDY OF REACTION WHEELS. PART 1: MEASUREMENT AND STATISTICAL ANALYSIS OF FORCE AND TORQUE IRREGULARITIES
J. A. Bosgra and H. Smilde Paris ESA 1 Feb. 1982 140 p refs 2 Vol.
(Contracts ESA-4482/80; Teldix-371.094; SNIAS-240.844; NIVR-1877)
(NLR-TR-82003-U-Pt-1; ESA-CR(P)-1610-Vol-1) Avail: NTIS HC A07/MF A01

Torque and force irregularities of running reaction wheels were studied. Results from noise measurements at constant wheel speeds on various types of current technology European reaction wheels, both with ball and magnet bearings and with dc or ac drive motor, are presented. The measured noise in radial and axial force and in torque about the rotation axis at constant wheel speeds was statistically analyzed and presented as spectral plots. Differences in noise chararacteristics between the various wheel types are indicated. As shown the larger part of the noise is wheel speed dependent, both in frequency and power. Major noise causes are dc motor commutation and ball bearing retainer movements. Author (ESA)

N82-32405# National Aerospace Lab., Amsterdam (Netherlands). Spaceflight Div.
EXPERIMENTAL AND SYSTEMS STUDY OF REACTION WHEELS. PART 2: SYSTEM STUDY ON WHEEL STATE FEEDBACK
J. J. M. Prins Paris ESA 1 Feb. 1982 113 p refs 2 Vol.
(Contracts ESA-4480/80; NIVR-1877)
(NLR-TR-82003-U-Pt-2; ESA-CR(P)-1610-Vol-2) Avail: NTIS HC A06/MF A01

Performance and implementation aspects of the operation of wheel systems which have their own internal feedback control system are discussed. A model following control concept is found to be superior. The reduction in wheel induced spacecraft attitude noise by employing wheel velocity or wheel attitude feedback is analyzed in the continuous domain. The digital wheel controller implementation aspects discussed include conventional z-plane PD type designs, use of a Kalman filter for wheel state observation, controller pole placement and linear quadratic optimal control design. For most designs a wheel sensor of the pulse counting type is assumed. Finally, autonomous wheel failure detection and reconfiguration is dealt with. Author (ESA)

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N82-32406# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.

WIND TUNNEL TESTS OF SPACE SHUTTLE EXTERNAL TANK INSULATION MATERIALS AT ELEVATED HEAT FLUX CONDITIONS Final Report, 7 Oct. - 11 Nov. 1981
A. S. Hartman and D. W. Stallings Arnold AFS, Tenn. AEDC Jan. 1982 57 p refs
(AD-A115723; AEDC-TSR-82-V4) Avail: NTIS HC A04/MF A01 CSCL 22/2

Wind tunnel tests of the space shuttle External Tank Foam Insulation were conducted in the von Karman Gas Dynamics Facility Tunnel C. The tests were conducted in two entries. On the first entry, Tunnel C was run at Mach 4 with a total temperature of 1030-1150 F and a total pressure which varied from 30-180 psia. Cold wall heating rates were changed by varying the wedge angle and by adding and removing a shock generator or a cylindrical protuberance. The second entry was conducted at Mach 10 with a total temperature of 1140 F and a total pressure of 1750 psia. Selected results from both entries are presented to illustrate the test techniques and typical data obtained. Author (GRA)

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N82-32407*# Research Triangle Inst., Research Triangle Park, N. C.
CONCEPTS FOR ON BOARD SATELLITE IMAGE REGISTRATION. VOLUME 4: IMPACT OF DATA SET SELECTION ON SATELLITE ON BOARD SIGNAL PROCESSING Final Report, 16 Jan. 1981 - 15 Jul. 1982
W. H. Ruedger, J. V. Aanstoos, and W. E. Snyder (North Carolina State Univ.) Sep. 1982 42 p refs
(Contract NAS1-15768)
(NASA-CR-165970; NAS 1.26:165970; RTI/1796/00-04F-Vol-4) Avail: NTIS HC A03/MF A01 CSCL 09F

The NASA NEEDS program goals present a requirement for on-board signal processing to achieve user-compatible, information-adaptive data acquisition. This volume addresses the impact of data set selection on data formatting required for efficient telemetering of the acquired satellite sensor data. More specifically, the FILE algorithm developed by Martin-Marietta provides a means for the determination of those pixels from the data stream effects an improvement in the achievable system throughput. It will be seen that based on the lack of statistical stationarity in cloud cover, spatial distribution periods exist where data acquisition rates exceed the throughput capability. The study therefore addresses various approaches to data compression and truncation as applicable to this sensor mission. Author

N82-32408# Range Commanders Council, White Sands Missile Range, N. Mex. Inter-Range Instrumentation Group.
TEST METHODS FOR TELEMETRY SYSTEMS AND SUBSYSTEMS. VOLUME 5: TEST METHODS FOR VEHICLE TELEMETRY SYSTEMS Final Report
1982 131 p
(AD-A116858; IRIG-118-82) Avail: NTIS HC A07/MF A01 CSCL 09/6

This document provides test methods only. No attempt has been made to establish an accept or reject criteria. Guidance for consistency of test setup and evaluation of results is included. Equipment model numbers have been intentionally omitted. Since step-by-step test equipment operating instructions are not provided, it is anticipated that supplemental test procedures may have to be prepared by the user to augment this document. Author (GRA)

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N82-32409# Boston Coll., Chestnut Hill, Mass. Dept. of Physics.
PARTICLE TRAJECTORIES IN A MODEL ELECTRIC FIELD 2
Paul Carini, Gabor Kalman, and Yaakov Shima 15 Dec. 1981 28 p
(Contract F19628-79-C-0031; AF Proj. 7661)
(AD-A116950; SR-2; AFGL-TR-82-0149) Avail: NTIS HC A03/MF A01 CSCL 20/3

The report examines the feasibility of neutralizing the potential difference that occurs on a spacecraft by emitting ions from the positively charged surface region of the spacecraft and lefting this current impact on the negatively charged surface region. The investigation was performed by making two different simplifying assumptions about the geometry of the problem. In the first case we approximated the geometry by two conducting infinite half planes. In the second case we approximated the geometry by two finite width constant charge density plates. In both cases we investigated the dependence of the particle trajectories on the origination, velocity, and direction of emission of the particles. Two generalizations emerge from the study: (1) shallow launch angles give more favorable trajectories; (2) for a given launch angle there is an optimum energy which yields a minimum impact distance. Author (GRA)

N82-32410# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
PRELIMINARY STUDY OF THE DYNAMIC CONTROL OF LARGE SPACECRAFT. VOLUME 1: SUMMARY Final Report
M. Burton and C. Rogers Paris ESA Nov. 1981 32 p 4 Vol.
(Contract ESTEC-4008/79)
(BAe-TP-7937-Vol-1; ESA-CR(P)-1608-Vol-1) Avail: NTIS HC A03/MF A01

Following a discussion of the nature of the LSS control problem a review is given of techniques for attitude and vibration control. The large number of flexible modes and their low damping complicates system modelling and identification and the selection of a low order design model may be difficult. The application of standard design techniques to a reduced order model is discussed. Modes excluded from the design model can easly become unstable and a number of techniques for avoiding this problem have been proposed. Other techniques provide theoretically robust controllers at the cost of a more lirnited design. A selection of techniques are applied to the generic model of a large spacecraft and their performance is discussed on the basis of eigenvalue analysis. Related problems, including shape control and actuator and sensors for application of large structures, are discussed and a literature survey presented. Author ESA

N82-32411# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
PRELIMINARY STUDY OF THE DYNAMIC CONTROL OF LARGE SPACECRAFT, VOLUME 2 Final Report
Paris ESA 1981 147 p 4 Vol.
(Contract ESTEC-4008/79)
(BAe-TP-7937-Vol-2; ESA-CR(P)-1608-Vol-2) Avail: NTIS HC A07/MF A01

Dyanamic interaction of flexible appendages with the controller is investigated. A classical control law, with actuators and sensors located on the rigid body is used. For truly large spacecraft (e.g. a communications platform or the solar power satellite) flexibility is distributed actuators and sensors. The status of these techniques is appraised. ESA

N82-32412# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
PRELIMINARY STUDY OF THE DYNAMIC CONTROL OF LARGE SPACECRAFT. VOLUME 3: CASE STUDIES Final Report
Paris ESA 1981 134 p 4 Vol.
(Contract ESTEC-4008/79)
(BAe-TP-7937-Vol-3; ESA-CR(P)-1608-Vol-3) Avail: NTIS HC A07/MF A01

A generic model of a large flexible spacecraft represents a platform 62.5 Sq Km with a rigid body at the center. This has similarities asuch as solar power stations, but is intended to have some of the dynamic properties of a large category of spacecraft, in particular its low inherent damping of the many flexible modes as well as the closeness of the natural frequencies. The structure would be built using a truss structure but for modeling purposes it is represented as an elastic continuum, prior to application of finite element analysis techniques. The spacecraft can be regarded as a typical large space structure. Using this 100 degree of freedom model as a starting point a number of lower order models were preposed for investigation of specific control problems. S.L.

N82-32413# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
PRELIMINARY STUDY OF THE DYNAMIC CONTROL OF LARGE SPACECRAFT. VOLUME 4: LITERATURE SURVEY Final Report
Paris ESA 1981 72 p refs 4 Vol.
(Contract ESTEC-4008/79)
(BAe-TP-7937-Vol-4; ESA-CR(P)-1608-Vol-4) Avail: NTIS HC A04/MF A01

A bibliography containing 399 citations on dynamic modeling, attitude and vibration control, shape control, and control technology of large space structures is presented. The subjects covered include: systems engineering, interactive analysis and design, structural concept, control systems, electronics implementation, advanced materials. actuators/propulsion, and sensors. S.L.

N82-32414# British Aerospace Aircraft Group, Bristol (England). Stress Engineering Office.
STUDY OF THE EVOLUTION OF STRUCTURAL ACOUSTIC DESIGN GUIDES, VOLUME 1 Final Report
R. J. Cummings and I. R. Farrow Paris ESA Nov. 1981 208 p 2 Vol.
(Contract ESA-4118/79/NL-AK)
(ESA/B44/40193; ESA-CR(P)-1609-Vol-1) Avail: NTIS HC A10/MF A01

Work performed on the development of the structural response prediction technique is described. The general statistical energy computer program (GENSTEP) was developed to permit the use of statistical energy analysis (SEA) techniques in predicting the response of linked structural and acoustic subsystems to noise excitation. The technique was further developed to improve the prediction when using some of the complex structural configurations found in satellites, including honeycomb and corrugated components. Methods were developed to evaluate the SEA parameters required. Also an extrapolation procedure not dependent on SEA was evaluated. The results show that SEA can be used as a design guide for predicting the response characteristics of spacecraft structures. Author (ESA)

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N82-32415# Aeronautical Research Associates of Princeton, Inc., N. J.
EFFECT OF TURBULENT FLUCTUATIONS ON INFRARED RADIATION FROM A TACTICAL MISSILE PLUME Final Report, 29 Apr. 1980 - 9 Feb. 1981
Blaine E. Pearce and Ashok K. Varma Feb. 1982 104 p refs
(Contract N60530-80-C-0165; SF31300000)
(AD-A117013; AD-E450035; ARAP-445; NWC-TP-6307) Avail: NTIS HC A06/MF A01 CSCL 20/6

Predictions of the effect of turbulent fluctuations of temperature and species concentrations on the infrared thermal emission from an afterburning exhaust plume of a tactical missile are summarized. The high spectral resolution emissions from portions of the 4.3 micrometers CO2 band are examined. A consistent set of mean flow and turbulence properties in the plume obtained from a second-order closure model of the turbulent flow is used. A precise closure model of the turbulent flow is also used. A precise formulation of the mean radiance is given which includes contributions of second order turbulence correlations and explicitly identifies the contribution of two point spatial correlations along the line of sight. These correlations are shown to affect the structure of individual spectral lines for nonoptically thin paths. Total plume intensities in narrow 5 cm to the minus 1 power wide spectral intervals in the CO2 blue and red spike regions are not significantly augmented by the turbulent fluctuations for this class of afterburning plumes. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N82-32416# California Univ., Los Angeles. Dept. of Chemistry.
EXPLORATORY HIGH PRESSURE CHEMISTRY Final Technical Report, 1 Apr. 1979 - 31 Mar. 1982
John A. Gladysz 31 Mar. 1982 9 p refs
(Grant AF-AFOSR-0092-79; AF Proj. 2303)
(AD-A117079; AFOSR-82-0522TR) Avail: NTIS HC A02/MF A01 CSCL 07/3

A novel 1,3-silatropic shift was observed in the acylation of a silylated iron anion. A high yield cycloaddition of allyl iron complexes to olefins under pressure was carried out. This reaction constitutes a relatively rare example of a 3 plus 2 cycloaddition to give a 5-membered carbocyclic ring. It was found that migratory insertion reactions of transition metal alkyls can be effected by the application of pressure. Author (GRA)

24 COMPOSITE MATERIALS

Includes laminates.

N82-32417* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MULTIWALL THERMAL PROTECTION SYSTEM Patent
Liam R. Jackson, inventor (to NASA) Issued 17 Aug. 1982 9 p Filed 5 Sep. 1979 Supersedes N80-12117 (18 - 03, p 0295)
(NASA-Case-LAR-12620-1; US-Patent-4,344,591;
US-Patent-Appl-SN-072857; US-Patent-Class-244-158A;
US-Patent-Class-244-132; US-Patent-Class-428-594;

US-Patent-Class-428-604; US-Patent-Class-428-607; US-Patent-Class-428-608) Avail: US Patent and Trademark Office CSCL 11D

Multiwall insulating sandwich panels are provided for thermal protection of hypervelocity vehicles and other enclosures. In one embodiment, the multiwall panels are formed of alternate layers of dimpled and flat metal (titanium alloy) foil sheets and beaded scarfed edge seals to provide enclosure thermal protection up to 1000 F. An additional embodiment employs an intermediate fibrous insulation for the sandwich panel to provide thermal protection up to 2000 F. A third embodiment employs a silicide coated columbium waffle as the outer panel skin and fibrous layered intermediate protection for thermal environment protection up to 2500 F. The use of multiple panels on an enclosure facilitate repair and refurbishment of the thermal protection system due to the simple support provided by the tab and clip attachment for the panels.

Official Gazette of the U.S. Patent and Trademark Office

N82-32418 Royal Armament Research and Development Establishment, Fort Halstead (England).

INVESTIGATION OF RESIDUAL STRESSES IN A HOT CURED GLASS FIBRE REINFORCED EPOXY RESIN COMPOSITE

M. J. Hinton Apr. 1982 45 p refs

(RARDE-4/82-; BR83131) Copyright. Avail: Issuing Activity

Basic lamina elastic constants and thermal expansion coefficients were determined for an E glass fiber reinforced epoxy resin system over a range of fiber contents. These were used as input data to a theoretical model which predicts laminate residual strains and stresses. Residual strains were also measured experimentally. Theory and experiment agree closely, indicating a stress-free temperature comparable to the heat deflection temperature of the resin. It is shown that residual stresses can be significant percentages of the ultimate strength of the lamina and must be allowed for in design. Author (ESA)

N82-32419 Royal Aircraft Establishment, Farnborough (England).

A NEW TETRA-EPOXIDE RESIN AS A MATRIX FOR ADVANCED COMPOSITES

L. N. Phillips and D. J. Murphy Nov. 1981 16 p refs

(RAE-TM-MAT-380; BR82008) Avail: Issuing Activity

Two versions of a tetraepoxide resin (epoxide equivalent weights 212, 235) used as a matrix for carbon fiber, were modified with a minor percentage of Bisphenol A resin, because of the absence of tack in the prepreg. The curing characteristics of the modified and unmodified resins were established. The resins were used with satin weave and unidirectional fabric reinforcement. The mechanical properties of the derived laminates were obtained at room temperature, and at 80 and 130 C. Resistance to a range of aircraft fluids was also examined. The best results are obtained with the lower molecular weight epoxide blended with Bisphenol A resin. Author (ESA)

N82-32420*# Boeing Commercial Airplane Co., Seattle, Wash.

BEHAVIOR OF DAMAGED GRAPHITE/EPOXY LAMINATES UNDER COMPRESSION LOADING Final Report, Jan. 1978 - Dec. 1979

B. A. Byers Aug. 1980 61 p refs

(Contract NAS1-15107)

(NASA-CR-159293; NAS 1.26:159293; D6-48975) Avail: NTIS HC A04/MF A01 CSCL 11D

The influence of three different resin systems on the damage tolerance of graphite/polymer laminates was evaluated. Testing consisted of both static compression and cyclic compression evaluation of 10.2 by 15.2 by 0.5 cm (4 by 6 by 0.2 in) laminates with circular holes, simulated delaminations, and low velocity impact. Damage growth under steadily increasing compression and cyclic compression loading was monitored. Damage size and impact-induced failures for the three materials were compared. Of the three material systems evaluated, the one most tolerant to impact damage exhibited the least delamination within the cross section due to impact, the highest transverse tension strain to failure, and the largest crack opening force, as determined from double cantilever beam tests. Author

N82-32421*# Boeing Commercial Airplane Co., Seattle, Wash.

ENVIRONMENTAL EXPOSURE EFFECTS ON COMPOSITE MATERIALS FOR COMMERCIAL AIRCRAFT Quarterly Progress Report

Martin N. Gibbons Mar. 1982 60 p refs

(Contract NAS1-15148)

(NASA-CR-165981; NAS 1.26:165981; D6-44815-14; QPR-14) Avail: NTIS HC A04/MF A01 CSCL 11D

The data base for composite materials' properties as they are affected by the environments encountered in operating conditions, both in flight and at ground terminals is expanded. Absorbed moisture degrades the mechanical properties of graphite/epoxy laminates at elevated temperatures. Since airplane components are frequently exposed to atmospheric moisture, rain, and accumulated water, quantitative data are required to evaluate the amount of fluids absorbed under various environmental conditions and the subsequent effects on material properties. In addition, accelerated laboratory test techniques are developed are reliably capable of predicting long term behavior. An accelerated environmental exposure testing procedure is developed, and experimental results are correlated and compared with analytical results to establish the level of confidence for predicting composite material properties. S.L.

N82-32422# Scientific Systems, Inc., Cambridge, Mass.

DETERMINATION OF MATERIAL PROPERTIES BY LIMITED SCAN X-RAY TOMOGRAPHY Final Technical Report, Sep. 1979 - Jan. 1981

Wolfram Jarisch Wright-Patterson AFB, Ohio AFWAL Sep. 1982 138 p refs

(Contract F33615-79-C-5132; AF Proj. 2418)

(AD-A116670; AFWAL-TR-81-4050) Avail: NTIS HC A07/MF A01 CSCL 20/8

The purpose of this program was to explore methods of increasing the speed of the computed tomography (C/T) inspection process. The report presents an analysis of a translational data collection scheme and compares that to the tradition rotation data taken when used in most C/T machinery. Author (GRA)

N82-32423# Illinois Univ., Chicago. Dept. of Materials Engineering.

FREE-EDGE AND CONTACT-EDGE SINGULARITIES IN LAMINATED COMPOSITES Final Report, 15 Aug. 1980 - 15 Aug. 1981

R. I. Zwiers and T. C. T. Ting Apr. 1982 88 p refs

(Contract DAAG46-80-C-0081)

(AD-A116439; AMMRC-TR-82-21) Avail: NTIS HC A05/MF A01 CSCL 11/4

This effort is part of the predictive response capability development to provide design criteria for space vehicles. For example, mechanical joints in structure have stress risers around the bolt holes due to the singularities from linear analysis. In this task the stress singularities at the free-edge and at the contact-edge of an interface in a laminated composite are studied. The composite is subjected to a uniform extension in the direction parallel to the plane of laminate layers. GRA

N82-32424# Ciba-Geigy Corp., Ardsley, N.Y. Plastics and Additives Div.

COMPOSITE REPAIR SYSTEM WITH LONG TERM LATENCY Final Report, 27 Oct. 1980 - 26 Jul. 1981

Jonas Weiss Nov. 1981 38 p

(Contract M62269-80-C-0711)

(AD-A116472; NADC-80126) Avail: NTIS HC A03/MF A01 CSCL 11/4

Novel latent epoxy hardeners which show promise for the field repair of composite structures of naval aircraft have been developed. At least one hardener is latent with epoxy resins for four to five months and exhibits good moisture resistance. These materials may provide the basis for a prepreg material to be used for the repair of graphite structural composites. Latent hardeners were prepared by reacting primary diamines with phthalic anhydride or phthalimide. These adducts are stable with multifunctional epoxy

resins (MY 720 and 0510) at ambient temperatures and cure the resins at 150 deg C (302 deg F). DSC analyses show heats of reaction centered in the 101-120 deg C range, indicating that complete cures may be achieved at these lower temperatures. Initial studies show Tg's to be relatively high (120 to 146 deg C) and temperature/humidity resistance to be good. The mechanism of the latency of these materials was explained by analogy with HT 939, a CIBA-GEIGY latent hardener containing diethylenetriamine (DETA). HT 939 is incompatible with the standard epoxy resins, but becomes compatible on heating and reacts. GRA

N82-32425# Villanova Univ., Pa.
AEROSTRUCTURE NONDESTRUCTIVE EVALUATION BY THERMAL FIELD DETECTION, PHASE 1: FUNDAMENTAL INFORMATION AND BASIC TECHNIQUE DEVELOPMENT
P. V. McLaughlin, E. V. McAssey, V. R. Emany, D. N. Koert, and J. M. Spitzer Lakehurst, N.J. Naval Air Engineering Center 25 May 1982 122 p refs
(Contract N68335-79-C-1084)
(AD-A115724; NAEC-92-157) Avail: NTIS HC A06/MF A01 CSCL 11/4

Methods of flaw detection in laminated fiber composite aerovehicle structures using infrared radiation detection techniques are described. Infrared thermography promises to provide a rapid method of damage detection in large structural surfaces. Two methods are described: externally applied thermal field (EATF) flaw detection where surface hot spots due to subsurface flaws are created by heating with a radiant heat source; and stress-generated thermal field (SGTF) flaw detection where 'hot spots' in viscoelastic composites are created at stress concentrations near structural flaws during high frequency, low magnitude cyclic loading. Analytical and experimental studies were performed on 8 to 32 ply graphite/epoxy laminates and 8 to 16 ply s2 glass/epoxy laminates containing delaminations and partial through holes to evaluate and develop EATF thermography. Results show that the conduction method of heat application is unsatisfactory for NDE purposes, and that a radiant energy source in excess of one solar constant is required for best results. GRA

N82-32426# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Mechanics and Surface Interactions Branch.
PROCEEDINGS OF THE SEVENTH ANNUAL MECHANICS OF COMPOSITES REVIEW
Stella D. Gates and Lisa A. Wilson Apr. 1982 333 p refs Conf. held at Dayton, Ohio, 28-30 Oct. 1981
(AF Proj. 2419)
(AD-A115795; AFWAL-TR-82-4007) Avail: NTIS HC A15/MF A01 CSCL 11/4

This report contains summaries of the presentations of the Seventh Annual Mechanics of Composites Review sponsored by the Air Force Materials Laboratory. Each paper was prepared by its presenter and is published here unedited. In addition to the presenter's summaries, a listing of both the inhouse and contractual activities of each participating organization is included.
Author (GRA)

N82-32427# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
PROCEEDINGS OF THE 1980 TRI-SERVICE CONFERENCE ON CORROSION, VOLUME 2 Final Technical Report, 7 Nov. 1980 - 15 Aug. 1981
Fred H. Meyer, Jr. Nov. 1980 493 p refs Conf. held at Colorado Springs, 5-7 Nov. 1980
(AD-A115875; AFWAL-TR-81-4019-Vol-2) Avail: NTIS HC A21/MF A01 CSCL 11/4

This report (volume II) includes all available papers from the 1980 Tri-Service Conference on Corrosion acquired after the compilation of Volume I in March 1981. The purpose of the 1980 Conference was to continue interservice Coordination in the areas of corrosion research and corrosion prevention and control. Specifically, the objectives were to make Department of Defense personnel, contractors and interested individuals aware of the important corrosion problems in military equipment, to present the status of significant corrosion research projects currently pursued by the military services and to provide a general forum for exchange of corrosion prevention and control information. GRA

N82-32428# Army Materials and Mechanics Research Center, Watertown, Mass.
PROCEEDINGS OF THE CRITICAL REVIEW: TECHNIQUES FOR THE CHARACTERIZATION OF COMPOSITE MATERIALS Final Report
May 1982 487 p refs Conf. held at Cambridge, Mass., 8-10 Jun. 1981 Sponsored in part by the Office of Naval Research, Boston
(AD-A116733; AMMRC-MS-82-3) Avail: NTIS HC A21/MF A01 CSCL 11/4

The objective of this Review was to evaluate the potential of new and/or improved techniques for predicting the performance of composite materials. A total of thirty-five technical papers were presented at the Review. The topics covered by session were: Cure Monitoring; Moisture; Predictive Composite Characterization; Advances of Significance to Composites; and Recapitulation. GRA

N82-32429# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
TIME-DOMAIN FIRST BORN APPROXIMATIONS TO ELASTODYNAMIC BACKSCATTER WITH APPLICATIONS TO NONDESTRUCTIVE EVALUATION OF COMPOSITES M.S. Thesis
Gregory T. Warhola Dec. 1981 79 p refs
(AD-A115566; AFIT/GE/ME/81D-2) Avail: NTIS HC A05/MF A01 CSCL 11/4

The first Born approximations to solutions of a time-domain integral equation were used to obtain the backscattered dilatation wave response from spherical and cylindrical inclusions of arbitrary homogeneous anisotropic elastic material embedded within a homogeneous isotropic host. For large ka, where the validity of the first Born approximation is questioned, the time waveform responses from cylinders and spheres are markedly different; for ka approaches limit of 0, they have identical time form with amplitudes dependent upon the volume of the scatterer. Excellent agreement with an experimental result for scattering from a cylindrical void was obtained for a value of ka = 0.32. A 'transparency condition' was obtained, allowing that for certain combinations of both density and stiffness of the scatterer and host, the scatterer appears transparent to the incoming wave in the first Born approximation. GRA

N82-32430# Naval Air Development Center, Warminster, Pa.
LOW VELOCITY, TRANSVERSE NORMAL IMPACT OF A CLAMPED PLATE Final Report
Richard E. Llorens and Lee W. Gause 5 Oct. 1981 60 p refs
(AD-A115760; NADC-81250-60) Avail: NTIS HC A04/MF A01 CSCL 11/4

A finite element solution for the response of a clamped plate subjected to central low speed transverse impact is presented. The solution is empirically corrected, on the basis of viscoelastic beam analysis, to admit damping. Comparisons of the numerical predictions of the corrected theory with central impact test results on graphite-epoxy composite laminates show excellent agreement for two of the three test studies. Author (GRA)

N82-32431# Science Applications, Inc., Wayne, Pa.
DEVELOPMENT OF AN AEROACOUSTIC METHODOLOGY TO EVALUATE HEATSHIELD MATERIAL PERFORMANCE Final Report, Feb. 1981 - Jan. 1982
Anthony L. Laganelli Wright-Patterson AFB, Ohio AFWAL Feb. 1982 142 p refs
(Contract F33615-81-C-3209; AF Proj. 2401)
(AD-A115606; SAI-067-82R-013; AFWAL-TR-81-3179) Avail: NTIS HC A07/MF A01 CSCL 11/4

An experimental program was conducted in the AFWAL Mach 6 and AEDC Shock Tube facilities in which acoustic fluctuating pressure data were acquired on flat plate TWCP specimens featuring smooth and rough surfaces. The TWCP specimens were instrumented with five Gulton microphones. The microphones placed in the model consisted of flush, ported, and backface

(blind hole) locations. Several l/d ported orifices were examined as well as depths from the boundary layer surface for the backface gages. The AEDC tests were structured to examine optimum ported orifices prior to the AFWAL Mach 6 tests. The TWCP specimens were exposed to turbulent boundary layer conditions at tunnel stagnation pressures of 700, 1400, and 2100 psi with a total temperature of 1100 deg. R, respectively. A correlation was developed for the ported hole sensors that can be related to the flush mounted sensors. Characterizing the backface (blind hole) gages with surface mounted sensors will require further data interpretation due to vibration. In general, rough walls augmented the acoustic energy levels as expected. A biased rough pattern (20 deg, angled to flow) indicated that acoustic measurements could be used as a diagnostic technique to determine the surface characteristics of TWCP ablation patterns. GRA

N82-32432# Societe Nationale Industrielle Aerospatiale, Suresnes (France). Lab. Central.
BEHAVIOR OF COMPOSITES IN A NATURAL ENVIRONMENT [COMPORTEMENT DES COMPOSITES EN ENVIRONNEMENT NATUREL]
J. N. Dewas, J. J. Bodu, and G. Hilaire 24 Feb. 1982 33 p refs In FRENCH Presented at Centre Francais de la Corrosion (CEFRACOR) Conf., 7 Mar. 1982
(SNIAS-821-551-103; C-43-876) Avail: NTIS HC A03/MF A01

Aging effects on resin that is used in manufacturing carbon fiber reinforced epoxy matrix materials were studied. Mechanical and environmental tests were conducted. Corrosion encountered when composites are riveted together with metal structures was also investigated. Anomalies associated with moisture diffusion in composites are identified and a Langmuir model for this type of diffusion is presented. The analytical prediction of moisture absorption in composites is discussed. Results highlight temperature and moisture induced stresses at the fiber matrix interface. A design safety coefficient is derived. Corrosion results indicate that riveting should be avoided. Author (ESA)

N82-32433# Societe Nationale Industrielle Aerospatiale, Suresnes (France). Lab. Central.
DAMAGE AND RUPTURE DUE TO TRACTION AND FATIGUE OF GLASS FIBER REINFORCED AND CARBON FIBER REINFORCED COMPOSITE MATERIALS [ENDOMMAGEMENT ET RUPTURE PAR TRACTION ET FATIGUE DE DEUX MATERIAUX COMPOSITES A FIBRES DE VERRE ET DE CARBONE]
D. Aliaga, G. Hilaire, and R. Esnault 4 Jun. 1982 13 p refs In FRENCH Presented at 3rd. Journee Natl. sur les Composites, Paris, 21-23 Sep. 1982
(SNIAS-821-551-104; C-44-127) Avail: NTIS HC A02/MF A01

The possibility of applying linear fracture mechanics to notched composites was studied. Possible measurement of fatigue damage evolution in these materials was also investigated. Utilization of the K factor was considered and the size of damaged zones at the crack tip was measured on a carbon fiber reinforced epoxy matrix composite and on a glass epoxy composite made of fiber glass sheets. Crack propagation was evaluated under cyclic loading. Delamination between sheets of the glass epoxy composite was treated. For the carbon fiber composite, the K factor provides a good global approach even if this parameter is insufficient for the description of the size and form of the damaged zone. For glass epoxy composites, linear fracture mechanics is useful as well. Author (ESA)

N82-32434# Cambridge Univ. (England). Dept. of Engineering.
CRACK PROPAGATION IN FIBROUS AND PARTICULATE COMPOSITES
T. H. Mao (Academia Sinica, Peking, China), P. W. R. Beaumont, and W. C. Nixon Nov. 1981 42 p refs Sponsored in part by The Royal Society and The Chinese Academy of Sciences
(PB82-182320; CUED/C-MATS/TR-89-1981; ISSN-0309-6505) Avail: NTIS HC A03/MF A01 CSCL 11D

Crack propagation in particulate and fibrous composites was studied by direct observation of advancing cracks in the scanning electron microscope, coupled with mechanical measurements on double torsion specimens. The results give insight into the strain field at the crack tip, the mechanism of crack advance, and the origins of the toughness of composites. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N82-32435 Defence Research Information Centre, Orpington (England).
INVESTIGATIONS ON THE SIMULTANEOUS ELECTROCHEMICAL DETERMINATION OF LEAD AND TIN. PART 1: POLAROGRAPHIC DETERMINATION IN ORGANIC HYDROCHLORIC ACID BASE SOLUTION
Lothar Metzger (Gutenberg Univ.), Guenter G. Willems (Gutenberg Univ.), and Rolf Neeb May 1982 17 p refs Transl. into ENGLISH from Fresenius Zeitschrift fuer Anal. Chem. (West Ger.), v. 288, 1977 p 35-40 3 Vol.
(DRIC-T-6633; BR83557) Copyright. Avail: Issuing Activity

Separated ac polarograms were obtained for lead and tin in an alcoholic base solution of hydrochloric acid. The best sensitivity with adequate separation was obtained in 1 M methanolic hydrochloric acid. Under these conditions the limit of sensitivity for both elements is 2.5 x 10 to the minus 7th power M. Two peaks could be evaluated in the presence of a 25-fold excess of lead peaks in a 50-fold excess of tin. Instructions for the determination of tin/lead in brass are given. Author (ESA)

N82-32436 Defence Research Information Centre, Orpington (England).
INVESTIGATIONS ON THE SIMULTANEOUS ELECTROCHEMICAL DETERMINATION OF LEAD AND TIN. PART 2: POLAROGRAPHIC DETERMINATION OF LEAD IN THE PRESENCE OF TIN AT LOWER TEMPERATURES
Lothar Metzger (Gutenberg Univ.), Guenter G. Willems (Gutenberg Univ.), and Rolf Neeb May 1982 9 p refs Transl. into ENGLISH from Fresenius Zeitschrift fuer Anal. Chem. (West Ger.) v. 292, 1978 p 20-22 3 Vol.
(DRIC-T-6634; BR83556) Copyright. Avail: Issuing Activity

The strong temperature dependence of the polarographic signal for tin in solutions of tetravalent tin was exploited in order to determine lead concentrations in the presence of a large excess of tin in a methanolic base solution of hydrochloric acid at a temperature of -32 C. An application of the procedure to the ac polarographic determination of lead in crude tin is described. Author (ESA)

N82-32437 Defence Research Information Centre, Orpington (England).
INVESTIGATIONS ON THE SIMULTANEOUS ELECTROCHEMICAL DETERMINATION OF LEAD AND TIN. PART 3: SIMULTANEOUS INVERSE VOLTAMMETRIC DETERMINATION OF LEAD AND TIN IN METHANOLIC HYDROCHLORIC ACID BASE SOLUTION WITHOUT CHANGE OF SOLUTIONS
Lothar Metzger (Gutenberg Univ.), Guenter G. Willems (Gutenberg Univ.), and Rolf Neeb May 1982 6 p refs Transl. into ENGLISH from Fresenius Zeitschrift fuer Anal. Chem. (West Ger.), v. 293, 1978 p 16-17 3 Vol.
(DRIC-T-6635; BR83555) Copyright. Avail: Issuing Activity

Experimental details for the determination of lead and tin in 1 M methalonic hydrochloric acid using simultaneous inverse voltammetry are given. Lead can be determined in the presence of a 30- to 50-fold excess of tin, and tin in a 10-fold excess of lead. Interference by thallium can be eliminated by separation, although it is not generally present. Author (ESA)

N82-32438*# Ohio State Univ., Columbus. Dept. of Physics.
PARAMETERS OF CO2 BANDS NEAR 3.6 MICRONS
M. L. Hoke and J. H. Shaw 1982 21 p refs
(Grant NsG-7469)
(NASA-CR-169309; NAS 1.26:169309) Avail: NTIS HC A02/MF A01 CSCL 07D

The intensities, widths, and positions of lines of three CO2 bands near 2750/cm were determined. The results are in general agreement with other measured and estimated values. Author

N82-32439# York Univ., Downsview (Ontario).
MAPPING OF THE ENERGY LEVELS OF METALLOPHTHALOCYANINES VIA ELECTRONIC SPECTROSCOPY, ELECTROCHEMISTRY, AND PHOTOCHEMISTRY Interim Technical Report, Aug. 1980 - Apr. 1981
A. B. P. Lever, S. Licoccia, K. Magnell, P. C. Minor, and B. S. Ramaswamy 1 Jun. 1982 21 p refs Submitted for publication
(Contract N00014-78-C-0592; NR Proj. 051-693)
(AD-A116405; TR-23) Avail: NTIS HC A02/MF A01 CSCL 07/4

The mapping of the energy levels in metallophthalocyanines is accomplished by a combination of electrochemistry, electronic spectroscopy, and photochemistry. This chapter reviews the electrochemical properties of metallopthalocyanines and includes a large amount of previously unpublished data. The results are rationalized in terms of the nature of the electron transfer, that is, redox at metal or ligand. Well-defined correlations are shown to exist between the ease of oxidation or reduction of the phthalocyanine ligand and the oxidation state, and/or polarizing power, of the metal ion. Solvent and ring substitution effects also are presented and explained. Charge transfer transition energies can be calculated directly from these data, and agreement between experiment and theory is excellent. Finally, the data are used to calculate both the photo-generated excited state redox energies and the thermodynamics of quenching by donors and acceptors.
Author (GRA)

N82-32440# Southwest Research Inst., San Antonio, Tex. Fuels and Lubricants Research Lab.
EFFECT OF FLAME TEMPERATURE AND FUEL COMPOSITION ON SOOTING TENDENCY IN A RESEARCH COMBUSTOR Interim Report, Jun. 1980 - Oct. 1981
D. W. Naegeli, L. G. Dodge, and C. A. Moses Dec. 1981 61 p refs
(Contracts DAAK70-80-C-0001; DAAK70-82-C-0001)
(AD-A116421; AFLRL-158) Avail: NTIS HC A04/MF A01 CSCL 21/2

Several fuel blends containing alkyl benzenes, methyl naphthalenes, tetralin and Indene were prepared with hydrogen contents ranging from 11.5 to 14.2 percent. The effects of burner inlet conditions on the sooting tendency of the test fuels were measured in a Phillips 2-inch diameter cylindrical combustor capable of inlet pressures and temperatures up to 1.6 MPa and 1030 K, respectively. Both flame radiation and opacity measurements were used to determine the soot formed in the primary zone of the burner. Flame temperature was measured by the Kurlbaum method. Combustion efficiency and fuel/air ratio were determined from gaseous emissions. A sensitivity of sooting tendency to H/C ratio was determined from the correlation of flame radiation intensity with H/C ratio. This sensitivity varied significantly with operating parameters such as burner inlet temperature and reference velocity. The effects of polycyclic aromatics were determined by comparing the sensitivity to H/C ratio of fuels containing alkyl naphthalenes and tetralin to that of the fuels blended with alkyl benzenes. The increased sooting tendency of fuels containing alkyl naphthalenes and tetralin was most strongly dependent on the fuel/air ratio and the reference velocity. GRA

N82-32441# Mechanical Technology, Inc., Annapolis, Md. Research and Development Div.
ANALYTICAL FERROGRAPHY STANDARDIZATION Final Report
Peter B. Senholzi and Alan S. Maciejewski Jan. 1982 125 p refs
(Contract N00014-81-C-0012)
(AD-A116508; MTI-82TR56) Avail: NTIS HC A06/MF A01 CSCL 07/4

Wear particle technology is a recent development in the equipment wear field. This technology is based on the analysis of wear debris as a nondestructive reflection of the surface wear condition of the respective monitored wear process. Such a monitoring approach can be applied to everything from simple wear testing to sophisticated multicomponent wear systems. Wear particle analysis technology is rapidly establishing itself as a valuable tool in both the wear prevention and wear control arenas. Author (GRA)

N82-32442# Dayton Univ., Ohio.
SEM STUDIES ON ABPBI/PBT CAST FILMS Interim Report, Jan. - Sep. 1980
A. K. Kulshreshtha and G. E. Price Apr. 1982 48 p refs
(Contract F33615-81-C-5019; AF Proj. 2419)
(AD-A116273; UDR-TR-82-16; AFWAL-TR-82-4047) Avail: NTIS HC A03/MF A01 CSCL 07/4

Scanning electron microscopy studies on poly-p-phenylene benzobisthiazole (PBT) a rigid rod polymer - and poly - 2,5 (6) benzimidazole, - a flexible coil polymer, - cast films indicate aggregates, or domains, rich in PBT polymer dominate the morphology. In blends containing 10-30% PBT, the shape of the aggregates or domains is ellipsoidal whereas in the 60% blend the morphology is distinctly lamellar or ribbon-like. GRA

N82-32443# Washington Univ., Seattle. Dept. of Chemistry.
THE ISOMERIZATION OF 1-METHYL CYCLOBUTENE BY SINGLE COLLISION ACTIVATION AT A SURFACE. VARIATION OF INITIAL ENERGY
R. Arakawa and B. S. Rabinovitch 1 Jun. 1982 36 p refs Submitted for publication
(Contract N00014-75-C-0690; NR Proj. 092-549)
(AD-A115814; TR-25) Avail: NTIS HC A03/MF A01 CSCL 07/3

The initial vibrational energy of molecules that collide with a hot surface was varied. The effect on the collisional reaction probability (Pc) was studied under single collision conditions. These experiments provide a sensitive test of the suitability of various analytical forms for the collisional transition probability matrix, P. The reaction system is the isomerization of methyl cyclobutene to pentadiene. A seasoned fused quartz surface was used over the temperature range Tr = 580 K - 800 K. Variation of the initial energy population vector of cyclobutene molecules was made by change of the initial temperature Tc in the range 273 K - 500 K. Gaussian forms of P prove to be the most suitable to fit the data.
Author

N82-32444# Texas Univ., Austin.
EXPERIMENTAL AND MODELING STUDIES OF HIGH TEMPERATURE COMBUSTION Final Report
W. C. Gardiner, Jr. 7 Jun. 1982 8 p refs
(Grant DAAG29-78-G-0174)
(AD-A115908; ARO-15826.10-CH) Avail: NTIS HC A02/MF A01 CSCL 21/2

Experiments and computer simulations on high-temperature combustion of small hydrocarbons are reported. Author (GRA)

N82-32445# State Univ. of New York, Buffalo. Dept. of Chemistry.
AN ELECTROCHEMICAL AND INFRARED STUDY OF CHLORANIL IN n-BUTYLPYRIDINIUM CHLORIDE: ALUMINUM CHLORIDEIONIC LIQUID
Graham Cheek and R. A. Osteryoung 1 Jun. 1982 40 p refs
(Contract N00014-79-C-0682)
(AD-A115882; TR-9) Avail: NTIS HC A03/MF A01 CSCL 07/4

The electrochemical behavior of tetrachlorobenzoquinone (chloranil, Q) has been studied in the aluminum chloride-n-butylpyridinium chloride (BuPyC) ionic liquid system. The reduction of chloranil proceeds in a two-electron step, giving rise to the

dianion. Both the electrochemistry and infra-red spectroscopy appear to indicate that, depending on the acidity of the system, chloranil is complexed by AC3, initially on the carbonyl oxygen, and on the ring chlorines. The second carbonyl appears to remain uncomplexed. Large shifts in the reduction potential for chloranil are observed as the solvent acidity (mole ratio of AC3 to BuPyc) is varied, indicating the extensive degree of interaction of the solute with the solvent. Cyclic voltammetry indicates the presence of one or as many as three species, depending on the acidity, which are concluded to be in rather slow equilibrium. Nernst plots of the potential of an indicator electrode as a function of the Q/Q= ratio indicate potentiometric reversibility; at a fixed Q/Q= ratio, the potential variation as a function of melt acidity indicates a gain of three AC3 molecules per Q= relative to Q, suggesting that it is complexed by 6 AC3 molecules in the acid system. Author (GRA)

N82-32446# General Electric Co., Schenectady, N. Y. Div. of Corporate Research and Development.
SYNTHESIS AND CHARACTERIZATION OF TRANSITION METAL COMPLEX SYSTEMS WITH NOVEL SOLID STATE PROPERTIES Final Scientific Report, 1 Apr. 1979 - 30 Mar. 1982
L. V. Interrante May 1982 27 p refs
(Contract F49620-79-C-0051; AF Proj. 2303)
(AD-A117064; SRD-82-043; AFOSR-82-0546TR) Avail: NTIS HC A03/MF A01 CSCL 07/3

The principal focus of this work has been on the preparation and study of pi-donor-acceptor compounds derived from the interaction of planar metal complexes and planar organic molecules. Included among the metal complex system studied are various bis(1,2-ethylenedithiolene) metal complexes, which have been employed as pi-acceptors, and some tetraazamacrocyclic complexes, used as pi-donors. In addition a new planar Ir(I) complex has been prepared using novel redox-active organic ligand system and examined as a source of conductive one-dimensional materials, using iodine to partially oxidize the Ir(I) complex units. These various compounds have been studied using electrical conductivity, magnetic susceptibility, and other solid state property measurement techniques. In addition, their crystal structures have been characterized using single crystal X-ray diffraction methods. The results provide new information regarding the solid state interactions in metal complex-containing systems and suggest the promise of such systems as a source of solid state materials with novel magnetic and electronic properties. GRA

N82-32447# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
PHOTOACOUSTIC SPECTROSCOPY OF CHEMICALLY MODIFIED SURFACES Ph.D. Thesis - Denver Univ.
Larry Wilson Burggraf Aug. 1981 278 p refs
(AD-A116777; AFIT-NR-81-16D) Avail: NTIS HC A13/MF A01 CSCL 07/4

Photoacoustic spectroscopy was applied to the study of surface species on chemically modified surfaces. The theory for thermally thick samples is cast into a form suitable for quantification. The photoacoustic magnitude and phase information are combined in a response function which is linear with optical absorption. The theory is extended to account for scattered light effects in intensely light scattering materials. Also, a method to correct for the effects of stray light in photoacoustic spectroscopy is presented. The potential of this spectroscopic technique for obtaining ultraviolet absorption spectra of organic functional groups immobilized on silica surfaces by silylation is demonstrated. The complexation of copper (II) by an ethylenediammine analog immobilized on silica gel by silylation was characterized by photoacoustic spectroscopy and heterogeneous binding studies. Independent mono and bis binding sites are formed on the silica surface. Photoacoustic spectroscopy was used to study Ni/gamma-Al2O3, Co/gamma-Al2O3 and Co-Mo/gamma-Al2O3 catalysts. GRA

N82-32448# Commissariat a l'Energie Atomique, Saclay (France).
THE THEORIES OF UNMIXING KINETICS OF SOLID SOLUTIONS
Georges Martin 19 Sep. 1979 105 p refs Presented at the Ecole d'Ete - Les Transformations de Phase Dans les Solides Mineraux, Aussois, France, 19-26 Sep. 1979
(CEA-CONF-4776) Avail: NTIS HC A06/MF A01

Theoretical approaches to the kinetics of solid state phase tranformation are investigated. Thermodynamic results on fluctuations in concentration and the driving force of unmixing are presented. The cluster kinetics approach, cooperative models, coarsening, and a stochastic description of unmixing are considered. J.D.

N82-32449# Department of Energy, New York. Environmental Measurements Lab.
A MANUAL FOR BON: A CODE FOR UNFOLDING MULTISPHERE SPECTROMETER NEUTRON MEASUREMENTS
Robert S. Sanna Aug. 1981 20 p refs
(DE82-000457; DOE/EML-394) Avail: NTIS HC A02/MF A01

Changes made in the iterative spectra unfolding code BON are documented. A detailed description of the code input and output is presented, along with the results of a test problem. J.M.S.

N82-32450# Cambridge Univ. (England).
THE DISSOLUTION OF ORGANIC ION EXCHANGE RESINS USING IRON-CATALYSED HYDROGEN PEROXIDE
N. Hawkings, K. D. Horton, and K. W. Snelling Dorchester United Kingdom'Atomic Energy Authority Oct. 1980 19 p refs
(AEEW-R-1390) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Feasibility studies of the dissolution/partial decomposition of radioactive waste resins by means of iron-catalysed hydrogen peroxide are presented. They show that the procedure is limited in its application and successfully treats only polystyrene/divinylbenzene based resins. Evaporation of the final solution produces a solid residue which is difficult to handle and results in only a relatively small reduction in volume. It is concluded that the method could be used to dissolve specific waste resins for easier handling and disposal, but is not of general applicability. DOE

N82-32451# Kent State Univ., Ohio. Dept. of Physics.
ENERGETIC NEUTRON SPECTROMETRY Ph.D. Thesis
Robert A. Cecil 1981 4 p
(Contract DE-AS02-76EV-02231)
(DE82-002156; DOE/EV-02231/1) Avail: NTIS HC A02/MF A01

Parameters of the experiment are summarized, and a brief description of three different energy regions is given. No data are given. DOE

N82-32452# Physical Sciences, Inc., Woburn, Mass.
EFFECTS OF PREIGNITION ON PULVERIZED-COAL COMBUSTION Quarterly Report, 1 Oct. - 31 Dec. 1981
Girard A. Simons, G. Kothandaraman, Steven P. Schertzer, and Mary Jane Palm 1981 47 p refs
(Contract DE-AC22-80PC-30293)
(DE82-010467; DOE/PC-30293/5; PSI-TR-303; QR-5) Avail: NTIS HC A03/MF A01

The results of Task 1 predict that high reactivity chars require high porosities and a higher concentration of large pores. The experimental studies of Task 2 illustrate the dependence of these quantities on heating rate and final temperature. the data obtained for Texas Lignite suggests that heating rate does not effect pore structure to the extent that the pore structure will significantly effect reactivity. There is, however, a tendency for higher heating rates to increase the relative number of large pores, thus slightly enhancing reactivity. Increased final temperatures tend to increase char porosities to the extend that char reactivity is significantly enhanced. Pyrolysis experiments were performed on a high volatile bitmuminous coal. It was found that the increase in porosity occurs primarily in the large macropores. This is distinct from the resuls for Texas Lignite where the increase in the porosity was distributed more uniformly with pore size, with slight preference toward the ultramicropores. Pyrolysis experiments have been conducted on 1 mm PSOC 140 coal. It was found that the particle size has

little influence on the distribution of porosity with pore size. The theory of pore evolution Task 3 is complete. DOE

N82-32453# Cornell Univ., Ithaca, N. Y. Sibley School of Mechanical and Aerospace Engineering.
HYDROGEN CYANIDE REACTIONS IN COMBUSTION SYSTEMS Final Technical Progress Report, 1 Aug. 1977 - 31 Mar. 1980
15 Jan. 1982 58 p refs
(Contract DE-AS02-77ER-04457)
(DE82-010830; DOE/ER-04457/1) Avail: NTIS HC A04/MF A01

A high temperature fast flow reactor was developed to obtain kinetic data for reactions in the 5 to 75 msec time scale and in the 1000 to 15000K temperature range. A study of the non-catalytic reduction of NO by NH3 was conducted in the flow reactor by using gas chromotography for analysis. Results obtained for the NH3/NO reaction in the presence of excess oxygen showed, as previously reported, that effective reduction of NO (between 60 and 90%) can be obtained by ammonia injection. Experiments conducted on the NH3/NO system with only trace amounts of oxygen present also showed significant reductions in [NO] and rates as fast or faster than those observed for the excess oxygen case. These results were explained in terms of a mechanism in which the trace oxygen acts to initiate the breakdown of NH3 to NH2 with additional oxygen species being supplied by the subsequent reaction of NH2 with NO. Finally, it was concluded that the results obtained were consistent with the competing mechanism for the formation and destruction on NO through reaction with single nitrogen species, such as NH3, which has been observed by other investigators. DOE

N82-32454# Sheffield Univ. (England). Dept. of Control Engineering.
A PARAMETRIC TRANSFER FUNCTION MATRIX FOR PACKED BINARY DISTILLATION COLUMNS HAVING UNEQUAL VAPOUR AND LIQUID CAPACITANCE
M. Guilandoust and J. B. Edwards Feb. 1982 19 p refs
(RR-171) Avail: NTIS HC A02/MF A01

A general transfer function matrix (TFM) was derived for symmetrically built packed distillation columns, separating ideal binary mixtures. This TFM was used to assess the adequacy of assuming zero vapor holdup in the model, and of setting the ratio of vapor to liquid holdups to unity for predicting the dynamics of a general system. Analytical results are substantiated in the frequency domain. Variations in the ratio of vapor to liquid holdups do not greatly influence the general dynamics of packed columns. When this ratio is set to unity, the resulting simple model can be used for dynamic analysis and controller design. Author (ESA)

N82-32455# Sheffield Univ. (England). Dept. of Control Engineering.
PARAMETRIC TRANSFER-FUNCTIONS FOR PACKED, BINARY DISTILLATION COLUMNS
J. B. Edwards and M. Guilandoust Feb. 1982 37 p refs Submitted for publication
(RR-170) Avail: NTIS HC A03/MF A01

A parametric transfer function matrix (TFM) is derived completely analytically for distillation columns. The calculation method is illustrated for a column that is symmetrical statically and dynamically, i.e., having a rectifier vapor/stripping section liquid capacitance ratio c = 1.0. This produces a completely diagonal TFM between the sum and difference of output composition changes and the circulating and product take-off flow rates. The TFM for c not = 1.0 is not diagonal at all frequencies, but analysis and simulation show that column behavior is not greatly affected by changes in this parameter. Long packed columns produce novel nonminimum phase effects when twin product control is attempted. Serious travelling wave phenomena can limit controller performance in short columns. The possibility of zero separation-gain is revealed. Computed shapes of inverse Nyquist loci are confirmed by analysis and numerical time domain simulation. Discrepancy between tray and packed column behavior results from the continuous equilibrium assumption for theoretical trays. Author (ESA)

N82-32456# AEG-Telefunken, Frankfurt am Main (West Germany). Forschungsinst.
OPTOELECTRONIC GAS ANALYTIC SYSTEM Final Report, Jun. 1980
Wolfgang Riedel Bonn Bundesministerium fuer Forschung und Technologie Dec. 1982 69 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-209; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14,70

An optoelectronic gas analysis system which utilizes lead chalcogenide diode lasers as a tunable monochromatic radiation source for ultrafine spectroscopy was developed. A method for the measurement of gas concentrations, using pulsed diode lasers, is explained. The transmissivity of a gas sample is measured with high resolution in the region of a specific absorption line. From the integral of the extinction, a quantity is obtained which is proportional to the concentration of molecules. A laboratory setup was built based on this principle of integrative spectroscopy. Special laser spectrometer modules were designed, including microcomputer control and signal processing units. Trial measurements were performed with satisfactory results. Author (ESA)

N82-32457# Kraftwerk Union A.G. Reaktortechnik, Erlangen (West Germany).
INVESTIGATIONS INTO THE USE OF A SWIRLING DUST COLLECTOR ON A PRESSURIZED FLUIDIZED BED COMBUSTION FURNACE STACK Final Report, Mar. 1981
Rudolf Pieper and Eduard Weber Bonn Bundesministerium fuer Forschung und Technologie Mar. 1982 105 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer forschung und Technologie
(BMFT-FB-T-82-034; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21,50

Experimental and theoretical efforts to increase the collecting capacity of a swirling dust collector in preparation for the use of this dust collector downstream from a pressurized fluidized bed combustion furnace were made. Laboratory tests were performed, companies and institutes were contacted on the subject of measurement techniques at high temperatures and pressures, and a theoretical calculation of the collecting processes in the dust collector was carried out. Experiments show that bunker extraction reduces clean gas dust loading by a maximum of approximately one half under normal conditions and with the test dust H 100. Further improvements are suggested by results from the theoretical calculation of velocity measurements. Author (ESA)

N82-32458# Environmental Protection Agency, Ann Arbor, Mich. Standards Development and Support Branch.
REFINING OF COAL-DERIVED SYNTHETIC CRUDES
John McGuckin Feb. 1982 49 p refs
(PB82-169095; EPA-AA-SDSB-82-4) Avail: NTIS HC A03/MF A01 CSCL 07A

The refining of coal derived (H Coal, EDS and SRC-II) synthetic crudes both alone in grass roots refineries and in combination with petroleum crudes in existing refineries is examined. The H Coal syncrude is the cheapest to refine and the SRC-II syncrude is the most expensive. While the costs per mBtu of refining syncrudes in grass roots or existing refineries is fairly close, the use of existing refineries will greatly reduce new capitol investment and appears to be the most likely scenario. GRA

N82-32459# National Bureau of Standards, Washington, D.C. Center for Analytical Chemistry.
A SURVEY OF THE RECENT LITERATURE ON SAMPLING FOR CHEMICAL ANALYSIS Final Report
Byron G. Kratochvil (Alberta Univ., Edmonton) and John K. Taylor Jan. 1982 33 p
(PB82-166265; NBS-TN-1153) Avail: NTIS HC A03/MF A01 CSCL 07D

Sampling is one of the most important steps in chemical

analysis, yet it is often poorly planned and executed. One reason is that key information on sampling is scattered and relatively inaccessible. This article summarizes the more important published articles obtained as the result of a literature search to obtain essential background information for the design of sampling plans and protocols for the National Environmental Specimen Bank. Each reference is briefly described so that its applicability to a specific sampling question can be judged. The compilation consists of 56 references on general aspects of sampling, 9 references on sampling agricultural and food products, 14 references on sampling atmospheres and gases, 18 references on sampling water and waste water, and 18 references on sampling miscellaneous materials. Author

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N82-32460 Defence Research Information Centre, Orpington (England).

BEHAVIOR OF AN 80-20 Ni-Cr ALLOY ON OXIDATION IN HUMID AIR BETWEEN 800 AND 1250 C

F. Armanet (Compiegne Univ. of Technology, France), P. Moulin (Paris Univ. 9), A. M. Huntz (Compiegne Univ. of Technology, France), A. Vejux, and G. Beranger May 1982 28 p refs Transl. into ENGLISH from Mem. Sci. Revue Metal. (France), v. 76, no. 2, 1979 p 119-132

(DRIC-T-6608; BR83559) Copyright. Avail: Issuing Activity

The oxidation in air of a nickel chromium alloy containing 20.2% chromium was studied at ambient humidity at temperatures between 800 and 1200 C for between 2 and 166 hr. This was compared with the behavior of the alloy under the same conditions but with the humidity increased. Surface oxides were studied by X-ray diffraction, oxidation kinetics were investigated by thermogravimetry and the morphology of oxide surfaces produced were studied by scanning electron micrography. Results show that the metallurgical condition of the alloy influences its oxidation behavior in moist air and also influences the nature and quantity of the oxides produced. Author (ESA)

N82-32461*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FAILURE MECHANISMS OF THERMAL BARRIER COATINGS EXPOSED TO ELEVATED TEMPERATURES

Robert A. Miller and Carl E. Lowell 1982 14 p refs Presented at the Intern. Conf. on Met. Coatings and Process Technol., San Diego, Calif., 4-9 Apr. 1982

(NASA-TM-82905; E-1289; NAS 1.15:82905) Avail: NTIS HC A02/MF A01 CSCL 11F

The failure of a ZrO2-8%Y2O3/Ni-14% Al-0.1% Zr coating system on Rene 41 in Mach 0.3 burner rig tests was characterized. High flame and metal temperatures were employed in order to accelerate coating failure. Failure by delamination was shown to precede surface cracking or spalling. This type of failure could be duplicated by cooling down the specimen after a single long duration isothermal high temperature cycle in a burner rig or a furnace, but only if the atmosphere was oxidizing. Stresses due to thermal expansion mismatch on cooling coupled with the effects of plastic deformation of the bond coat and oxidation of the irregular bond coat are the probable life limiting factors. Heat up stresses alone could not fail the coating in the burner rig tests. Spalling eventually occurs on heat up but only after the coating has already failed through delamination. Author

N82-32462*# Grumman Aerospace Corp., Bethpage, N.Y. Research and Development Center.

SPAR IX REPORT FOR EXPERIMENT 76-22. DIRECTIONAL SOLIDIFICATION OF MAGNETIC COMPOSITES

Ron G. Pirich Jun. 1982 55 p refs

(Contract NAS8-32219)

(NASA-CR-162077; NAS 1.26:162077; RE-642) Avail: NTIS HC A04/MF A01 CSCL 11F

The role of gravity on Bridgman-Stockbarger directional solidification of eutectic Bi/MnBi was studied in reduced gravity during the SPAR IX flight experiment and contrasted with an earlier SPAR VI flight experiment and normal gravity (one-ge) investigations. The directional solidification of eutectic Bi/MnBi results in a low volume fraction, faceted/non-faceted aligned rod eutectic whose MnBi rod size, interrod spacing, thermal and magnetic properties are sensitive functions of solidification processing conditions. Four samples were solidified during the 280-s, low gravity interval of the SPAR IX flight experiment at a growth velocity of 50 cm/h. This furnace velocity is near the maximum growth rate which a planar furnace isotherm may be maintained. The morphology of the flight samples showed striking differences compared with identically processed normal gravity samples. As was observed during the SPAR VI experiment conducted at a lower solidification velocity of 30 cm/h, the MnBi rod diameter and interrod spacing distributions were significantly smaller, approximately 50%, for the low gravity samples. Accompanying the smaller MnBi rod diameters, the smallest ever achieved in the Mn-Bi system, was an increase in permanent magnetic properties. Author

N82-32463*# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.

CRYSTAL NUCLEATION IN GLASS-FORMING ALLOY AND PURE METAL MELTS UNDER CONTAINERLESS AND VIBRATIONLESS CONDITIONS Annual Report

Frans Spaepen and David Turnbull Jul. 1982 15 p refs

(Contract NAS8-32691)

(NASA-CR-162075; NAS 1.26:162075) Avail: NTIS HC A02/MF A01 CSCL 11F

The undercooling behavior of large spheroids of Pd40Ni40P40 was investigated. By surface etching, supporting the specimens on a fused silica substrate, and successive heating and cooling, crystallization can be eliminated, presumable due to the removal of surface heterogeneities. By this method samples up to 3.2g with a 0.53 mm minor diameter, were made entirely glassy, except for some superficial crystals comprising less than 0.5% of the volume. These experiments show that a cooling rate of approximately 1 K/sec is adequate to avoid copious homogeneous nucleation in the alloy, and that by eliminating or reducing the effectiveness of heterogeneous nucleation sites, it is possible to form bulk samples of this metallic glass with virtually unlimited dimensions. S.L.

N82-32464# Rome Air Development Center, Griffiss AFB, N.Y.

SOLDERABILITY STUDIES USING THE MENISCOGRAPH

Mark R. Cammarere Mar. 1982 54 p refs

(AF Proj. 2338)

(AD-A116115; RADC-TR-82-82) Avail: NTIS HC A04/MF A01 CSCL 13/8

Meniscograph solderability tests were conducted in-house on an extremely large number of specimens (7000) obtained as contract residue. Parameters evaluated were primary and secondary specimen coatings, thickness of coatings, environments that specimens had been exposed to, temperature of the solder bath, and type of flux. Results quantify the solderability of various coatings, and compare the results of the meniscograph test method with the visual test method. Author

N82-32465# Tuskegee Inst., Ala. School of Engineering.

A STUDY OF CUMULATIVE FATIGUE DAMAGE IN 2011-T3 ALUMINUM ALLOY Technical Report, 15 May 1980 - 14 Aug 1981

Shaik Jeelani and Purander A. Reddy Aug. 1981 70 p refs

(Contract N00019-80-C-0564)

(AD-A116513; TI-NAVY-3) Avail: NTIS HC A04/MF A01 CSCL 11/6

This report describes the experimental facility developed at Tuskegee Institute, Tuskegee, Alabama, to study the effect of cumulative fatigue damage in selected materials. The equipment

procured consists of direct tension-compression fatigue testing machines Model DS-600 HLM and DS-6000 HLM instrumented to conduct fatigue tests on Aluminum, steel and super alloys under various stress sequences. Specimen profiler, heat treatment furnace and electropolishing apparatus were purchased and/or developed for specimen preparation. Experimental data were generated using 2011-T3 aluminum alloy specimens under stress ratios R=-1, R=-0.5, and R=0, for low-high, low-high mixed, and high-low mixed stress sequences. Analysis of the data has indicated that the predicted cumulative fatigue damage and fatigue life are in close agreement for low-high and low-high mixed stress sequences under all stress ratios as compared with those obtained experimentally, whereas the theoretical values for high-low and high-low mixed stress sequences under all stress ratios were more conservative than those obtained experimentally.

Author (GRA)

N82-32466# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Metallurgy and Materials Science.

INDIVIDUAL AND COMBINED EFFECTS OF SULFUR AND PHOSPHORUS ON THE TOUGHNESS OF HIGH STRENGTH STEELS Final Report, Nov. 1979 - Nov. 1981

Edward Chang and John F. Wallace Watertown, Mass. Army Materials and Mechanics Research Center May 1982 177 p refs

(Contract DAAG46-79-C-0094; DA Proj. 1L1-62105-AH-84)

(AD-A116307; AMMRC-TR-82-33) Avail: NTIS HC A09/MF A01 CSCL 11/6

This study sought to determine the feasibility of specifying a maximum sum of phosphorus plus sulfur contents rather than a maximum for each element as related to the effects that these elements exert on the toughness of steel. A computer analysis of the literature was conducted on the influence of phosphorus and sulfur in the toughness of steel. Then, an experimental program was undertaken to produce a series of 4340 cast steels with a matrix of phosphorus and sulfur contents including low, medium and high values of each. These steels were heat treated by oil quenching to martensite and tempering at 1100 F to a 150 ksi yield strength and at 400 F to a 220 ksi yield strength. The steels were then tested to determine the tensile properties, Charpy V-notch transition curves for regular and precracked specimens and the static fracture toughness properties. The behavior of phosphorus and sulfur on the toughness of these steels is sufficiently different that it does not appear feasible to substitute the sum of the elements for maxima for each in specifications for steels requiring specific toughness properties. Phosphorus raises the transition temperature and embrittles the steel significantly, particularly at high strengths and in the presence of sharp notches. Phosphorus is in supersaturated solid solution in the steel and embrittles the steel because of the higher friction stress of the lattice for dislocation motion. Sulfur increases the number of sulfide inclusions and lowers the toughness by the decohesion of sulfide inclusions during the early stages of plastic deformation of the matrix. GRA

N82-32467# Climax Molybdenum Co. of Michigan, Detroit.

CARBURIZED HIGH TEMPERATURE STEELS Final Report, 28 Feb. 1980 - 28 Dec. 1981

D. E. Diesburg Watertown, Mass. Army Materials and Mechanics Research Center Apr. 1981 44 p

(Contract DAAG46-80-C-0018)

(AD-A116559; AMMRC-TR-82-24) Avail: NTIS HC A03/MF A01 CSCL 11/6

A detailed fracture toughness evaluation before and after a 1000-hour treatment at 315 C (600 F) of candidate steels for use at elevated temperatures in the carburized condition showed that CBS1000 offered the best combination of toughness and retention of hardness at elevated temperature. The toughness of X2(M) and X-53 decreased by about 50% during the 1000-hour treatment while that of CBS1000 changed very little. A separate study comparing six experimental steels concluded that a composition similar to that of CBS1000 had the highest impact fracture strength, even higher than that of SAE 9310. Author (GRA)

N82-32468# Dayton Univ., Ohio.

DEVELOPMENT AND EVALUATION OF WIDE CLEARANCE BRAZE JOINTS IN GAMMA PRIME ALLOYS Final Technical Report, 1 May 1979 - 1 May 1981

J. W. Chasteen Wright-Patterson AFB, Ohio AFWAL Mar. 1982 203 p refs

(Contract F33615-79-C-5033; AF Proj. 2418)

(AD-A116365; AFWAL-TR-82-4016) Avail: NTIS HC A10/MF A01 CSCL 11/6

The mechanical properties of wide-clearance brazed butt joints in ALLOY 713C are reported. The joints vary in clearance from 10 to 70 mils and are made by a two-step technique. The joint is first filled with a powdered metal which has a relatively high melting point and then a partial sintering step is performed. The joint is completed by filling the porous sinter powder with a nickel brazing alloy. Brazing filler metal powders and sinter filler metal powders were evaluated for their compatibility and brazing was improved by cleaning the base metal pieces by the fluorocarbon cleaning process (FCP). For the right filler metal combination (Rene 80 with D 15 alloy) joint tensile strengths rivalled the base metal. There is no evidence of variations in strength with widths of clearance. In slow strain rate tests such as thermal fatigue and stress rupture, the results were widely scattered. The scattering is related to a plane of pores that develops at the upper faying surface of the joint during brazing. A case is made for the probability that the mechanical properties of such joints, when of high integrity, would rival and perhaps excel those of the ALLOY 713 base metal. Author (GRA)

N82-32469# Dayton Univ., Ohio.

AN EMPIRICAL MODEL FOR LOAD RATION AND TEST TEMPERATURE EFFECTS ON THE FATIGUE CRACK GROWTH RATE OF ALUMINUM ALLOY 2024-T351 Interim Report, Jan. - Dec. 1981

Russell R. Cervay Apr. 1982 51 p refs

(Contract F33615-80-C-5011; AF Proj. 2421)

(AD-A116567; UDR-TR-82-42; AFWAL-TR-82-4025) Avail: NTIS HC A04/MF A01 CSCL 11/6

Constant amplitude loading fatigue crack growth rate test data were generated for aluminum alloy 2024-T351 at 20 test conditions: the combination of five load ratios, 0.01, 0.1, 0.3, 0.5, and 0.6 and four test temperatures, 72 degrees, 200 degrees, 300 degrees, and 400 degress F (22 degrees, 93 degrees, 149 degrees, and 204 degrees C, respectively). A mathematical model of the shift in the linear data region with the variation in test temperature and/or load ratio was formulated. The model approximates the log-Paris coefficient as a linear relationship of both the R-ratio and test temperature assuming all other test parameters remain constant. Author (GRA)

N82-32470# Army Materials and Mechanics Research Center, Watertown, Mass. Metals Research Div.

THE EFFECT OF SOLUTION TREATMENT TEMPERATURE ON STRESS CORROSION SUSCEPTIBILITY OF 7075 ALUMINIUM ALLOY

C. R. Shastry (Steel Authority of India), M. Levy, and A. Joshi (Perkins-Elmer Corp., Mountain View, Calif.) 16 Jan. 1981 25 p refs Submitted for publication

(DA Proj. 1L1-62105-AH-84)

(AD-A115869; AMMRC-TR-82-31) Avail: NTIS HC A02/MF A01 CSCL 11/6

The effect of varying solution heat treatment temperature on the stress corrosion behavior of 7075 aluminum alloy was studied using double cantilever beam self-stressed specimens. Concentrations of magnesium, copper, and zinc at grain boundaries for different heat treatments were determined by scanning Auger microscopic analysis of grain boundary fracture surfaces. It is suggested that changes in solution treatment temperature affect the stress corrosion susceptability by changing the grain boundary composition and the metallurgical microstructure. R.J.F.

N82-32471# Michigan Technological Univ., Houghton. Dept. of Metallurgical Engineering.

EFFECTS OF SHOCK PULSE VARIABLES ON SHOCK STRENGTHENING OF METALS Final Report, 10 Apr. 1979 - 9 Apr. 1982

Donald E. Mikkola 7 Jun. 1982 12 p refs
(Contract DAAG29-79-C-0076)
(AD-A115784; ARO-16227.5-MS; FR-1) Avail: NTIS HC A02/MF A01 CSCL 11/6

The effects of shock pulse amplitude and duration on the hardening response and substructure of Cu-8.7Ge, Cu, Mo-35Re, and Mo have been studied. By means of flyer plate experiments, very short pulse durations (< 0.1 microsec) have been shown to given time-dependent hardening effects. These have been related to the time dependence of plastic deformation processes. In particular, the development of twins and the sequence of twin formation leads to effective strengthening by twin boundaries. Also, twins form in much shorter times than previously demonstrated. Dislocation generation rates are at least 10 to the 21st to 10 to the 22d power sq m/s for the shock conditions studied. Laser-induced shock pulse studies gave results in agreement with the flyer plate results. It has been concluded that the results of this work have important implications for stress-time modeling and for other effects, such as dynamic fracture, or spallation.

Author (GRA)

N82-32472# Minnesota Univ., Minneapolis.

MACRO/MICRO STUDIES OF HYDROGEN EMBRITTLEMENT MECHANISMS IN TITANIUM AND ALUMINUM ALLOYS Final Report, Oct. 1976 - Oct. 1981

W. W. Gerberich Apr. 1982 25 p
(Grant AF-AFOSR-3133-77; AF Proj. 2306)
(AD-A116025; AFOSR-82-0508TR) Avail: NTIS HC A02/MF A01 CSCL 11/6

Systematic studies of environmental effects on fracture in two alpha/beta titanium alloys, one beta titanium alloy and 7475 aluminum alloys have been accomplished. Ti-6Al-6V-2Sn has been tested for its hydrogen-induced cracking behavior under sustained loads. The influence of frequency and microstructure on fatigue crack growth have also been studied. Fatigue crack growth in Ti-5Al-4Mo, as a function of hydrogen content, temperature and Widmanstatten colony size, was then studied. Mechanical data have been obtained along with TEM and SEM characterizations. Modelling for fatigue thresholds has been attempted to explain dislocation, microstructure and hydrogen effects. Ti-30 Mo has been studied for effects of hydrogen on dislocation dynamics, cleavage fracture stress and fatigue crack propagation. Fractography (SEM) has been used to characterize the fracturing processes and modeling attempted to explain the hydrogen effects. Hydrogen effects in aluminum alloys are not as obvious as those in titanium alloys. Both cathodic and gas-phase charging did not significantly increase the hydrogen content of this material. Mechanical properties did not seem to change decisively after hydrogen charging. But the lack of a macroscopic effect does not preclude a hydrogen mechanism in environmentally assisted events.

Author (GRA)

N82-32473# Martin Marietta Labs., Baltimore, Md.

THE DELAYED FRACTURE OF ALUMINUM ALLOYS, END OF YEAR REPORT Progress Report, 16 Mar. 1981 - 15 Mar. 1982

Joseph R. Pickens, David Venables, Guy D. Davis, and Jonathan R. Gordon Mar. 1982 48 p refs
(Contract N00014-81-C-0342)
(AD-A115693; MML-TR-82-9C) Avail: NTIS HC A03/MF A01 CSCL 11/6

The mechanisms of failure of high-strength aluminum alloys in saline environments was investigated. It was found that the mechanism of stress corrosion cracking (SCC) in a commercial Al-Mg alloy, 5083, is dominated by hydrogen embrittlement (HE). The dominant contribution of HE was discerned by comparing SCC susceptibility under Modes I and III loading. The influence of the surface oxide film on the SCC susceptibility of 7075 and 7175 alloys was also examined. It was found that unlike certain high purity alloys, the susceptibility of these commercial alloys is not significantly influenced by the composition of the oxide. In these 7xxx alloys, the insoluble constituent particles provide sites for SCC initiation. The greater susceptibility of 7075, compared with its higher purity version, 7175, is in part a result of its lower value fraction of the constituent particles. Author (GRA)

N82-32474# Rockwell International Corp., Thousand Oaks, Calif. Science Center.

MECHANISMS BY WHICH HUMIDITY ALTERS DUCTILITY Final Report, 15 Apr. 1979 - 14 Apr. 1982

W. L. Morris, M. R. James, and R. V. Inman Jun. 1982 78 p refs
(Contract N00014-79-C-0334)
(AD-A116030; SC5211.3FR) Avail: NTIS HC A05/MF A01 CSCL 11/6

The effects of atmospheric humidity and of internal hydrogen on localized surface ductility of a A1 2219-T851 alloy have been characterized. A reference gauge technique was used to measure the peak tensile plastic strains which develop during fatigue within individual grains at the surface of the alloy. These are sensitive to environment and can exceed 0.5%, even when the bulk deformation is linearly elastic. The average strain at the surface is controlled by the subsurface, resulting in a mixed pattern of tensile and compressive strains from grain to grain. The hysteresis loops open more rapidly with fatigue within grains having large distances of slip between boundaries at the surface. Constituent particles are fractured when the width of the local stress-strain hysteresis loop increases to a critical value. A simple strain energy criterion for particle fracture is used to model the probability of particle fracture from the distance of slip from the particle to the grain boundary. Agreement is achieved with experimental data by assuming that environmental factors alter only the local ductility of the matrix material within individual grains, and not the particle fracture surface energy. Author (GRA)

N82-32475# Battelle Columbus Labs., Ohio.

MECHANICAL-PROPERTY DATA Ti-10V-2Fe-3A1 ALLOY. ISOTHERMALLY FORGED

Jun. 1982 7 p
(Contract F33615-80-C-5168)
(AD-A116987) Avail: NTIS HC A02/MF A01 CSCL 11/6

Ti-10V-2Fe-3A1 is a recently developed, metallurgically near-beta alloy. The alloy is capable of attaining a variety of strength levels, depending on the selection of heat treatment. A major advantage over other alloys is the excellent forgeability. It forms readily at temperatures below those required for Ti-6Al-4V. The Ti-10V-2Fe-3A1 material used in this evaluation was received as 6 discs 7 inches (178 mm) in diameter x 1/2-inch (12.7 mm) thick. The material was produced by RMI and isothermally forged by TRW. Author (GRA)

N82-32476# Dartmouth Coll., Hanover, N.H. Dept. of Physics.

LATTICE-BACKSCATTERING EFFECTS FOR ELECTRONS ON THE FERMI SURFACE OF DILUTE ALUMINUM ALLOYS

W. Joss, R. Monnier, L. Cole, W. E. Lawrence, and M. Manninen (Helsinki Univ.) Dec. 1981 20 p refs Prepared in cooperation with Eidgenoessische Technische Hochschule
(Contract DE-AS02-76ER-02315)
(DE82-007843; DOE/ER-02315/16) Avail: NTIS HC A02/MF A01

Anisotropic impurity-induced scattering rates and their orbital averages (Dingle temperatures) are expressed in terms of a set of coefficients determined by the band structure of the pure host, and phase shift parameters describing the scattering from a specific impurity. Coefficients in a previous multiple-plane-wave based calculation for dilute Al-Li were evaluated. The calculation of Li-induced phase shifts was a self-consistent one based on the density functional formalism, but neglected lattice backscattering effects. The so-called Friedel phase shifts obtained from a KKR Green's function calculation were used together with the previously calculated host band structure coefficients in a mixed ab-initio calculation of the Dingle temperature. The agreement with experiment is improved considerably. it is concluded that even a

relatively free-electron-like host such as aluminum can produce significant lattice backscattering if the impurity is a strong scatter of conduction electrons. DOE

N82-32477# Pennsylvania Univ., Philadelphia. Dept. of Materials Science and Engineering.
TEMPER EMBRITTLEMENT OF CrMoV TURBINE ROTOR STEELS Interim Report
Q. Zhe, S.-C. Fu, and C. J. McMahon, Jr. Feb. 1982 51 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 559)
(DE82-902067; EPRI-CS-2242) Avail: NTIS HC A04/MF A01

Samples from the hot and cold ends of two retired chromium-molybdenum-vanadium steam turbine rotors and of the failed Gallatin rotor were studied with respect to the degree of temper embrittlement, fracture mode, impurity segregation, and microstructure in the as-received condition and after various heat treatment. The Joppa material showed no temper embrittlement, presumably due to its relatively higher purity and due to the presence of ferrite. The Buck material exhibited an extraordinarily large amount of temper embrittlement, due to its unusually large contents of P and Sn, both of which were found to be segregated to the prior austenite grain boundaries, particularly at the hot end of the rotor. The Gallatin material from the hot end exhibited some temper embrittlement due to P segregation, but because of its extraordinarily fine grain size. DOE

N82-32478# Institut de Soudure, Paris (France).
STUDY OF THE METALLURGICAL AND MECHANICAL EFFECTS OF PARTIAL RELAXATION TREATMENTS Final Report [EFFETS METALLURGIQUES ET MECANIQUES DES TRAITEMENTS DE RELAXATION PARTIELLE]
Senlis, France Centre Technique des Industries Mecaniques Feb. 1982 136 p In FRENCH
(Contract CETIM-4-79-5725)
(CETIM-12-G-203) Avail: NTIS HC A07/MF A01

Three steels (A42; A52; E420) and two welding electrodes (E43; E51) were characterized for the variation in transition temperature at 28 Joules as well as for traction properties. Specimens underwent heat treatment at different temperatures (550 C; 600 C; 650 C) combined with different time periods (1 hr; 5 hr; 24 hr). An elevation in the transition temperature for all three steels after heat treatment is noticed; the least disfavorable method is 550C/1hr. Traction properties diminish. Generally, results justify a tendency to reduce relaxation heat treatment temperatures. Author (ESA)

N82-32479# Centre Technique des Industries Mecaniques, Senlis (France).
STUDY OF THE WORKABILITY OF POWDER METALLURGY HIGH SPEED STEELS Final Report [ETUDE DES PROPRIETES D'EMPLOI DES ACIERS RAPIDES ELABORES PAR METALLURGIE DES POUDRES]
M. A. Pailleux Sep. 1981 70 p refs In FRENCH
(CETIM-12-A-371) Avail: NTIS HC A04/MF A01

The workability (forgeability, machinability, toughness) of powder metallurgy (PM) high speed (HS) steels was compared, for the same properties, with HS steels obtained by classical metallurgy. Data on mechanical properties were acquired from the literature, from manufacturers, and from heat treatment shops. Simultaneously, laboratory tests were carried out. Planar flexibility of these materials was studied as a measure of toughness and of the elastic limit in function of heat treatment parameters. Hardness tests were also performed. Results highlight the superior properties of PMHS steels, especially in application as a tool steel.
Author (ESA)

N82-32480# Centre Technique des Industries Mecaniques, Senlis (France).
CATALOG OF SURFACE HEAT TREATMENTS Final Report [CATALOGUE TRAITEMENTS THERMIQUES SUPERFICIELS]
C. Tournier and J. P. Peyre Mar. 1982 168 p refs In FRENCH
(CETIM-12-G-079) Avail: NTIS HC A08/MF A01

As the result of a survey of the literature, a synthesis of the state of the art of heat treatment is presented. Structure-mechanical properties relations are summarized with reference to cementation, carbonitriding, nitriding, surface hardening (quenching), and sulfation. A method of choice, concerning heat treatments, is given. Choice cirteria, based on mechanical measurement, characterization, and structure, are reviewed. This information allows for the rational choice of heat treatment to be employed, in function of desired mechanical properties of a part, and at the design phase. Author (ESA)

N82-32481# Centre Technique des Industries Mecaniques, Senlis (France).
MEASUREMENTS OF SURFACE ALTERATIONS DURING SALT BATH HEAT TREATMENT: RESEARCH INTO LIMITING THESE EFFECTS Final Report [MESURES DES ALTERNATIVES DE SURFACE EN TRAITEMENT THERMIQUE EN BAINS DE SEL: RECHERCHE POUR LEUR LIMITATION]
A. Pailleux Apr. 1982 135 p refs In FRENCH
(CETIM-12-G-264) Avail: NTIS HC A07/MF A01

High temperature (1 200 C) salt bath heat treatment of high speed steels was studied. The depth to which the steel surface was altered in function of heat treatment conditions (austenitization time, cooling mode) was determined. The nature and quality of the salts were also controlled. Besides specifying the advantages of salt baths, results allow for the optimization of salt bath parameters, leading to the improvement of workpiece surface characteristics. Author (ESA)

N82-32482# Centre Technique des Industries Mecaniques, Senlis (France).
GPN ACTIVITIES. POLLUTION LOSSES [ACTIVITES GPN POLLUTION DECHETS]
Laroche Apr. 1982 23 p In FRENCH
(CETIM-16-C-050; Rept-1) Avail: NTIS HC A02/MF A01

The possibility of directly regenerating sulfuric acid stripping baths by either dc or pulsed current electrolysis was investigated. Results show that the baths studied are too acid and/or do not have a high enough iron content for this process to work. Nevertheless, these first negative results do not rule out pulsed current electrolysis in a more complex process. Author (ESA)

N82-32483# Southwest Research Inst., San Antonio, Tex.
MICROSTRUCTURAL STUDY OF FAILURE MECHANISMS DURING MECHANICAL TESTING IN COAL GASIFICATION ENVIRONMENTS Annual Report, Mar. 1980 - Feb. 1981
R. A. Page Nov. 1981 50 p refs
(Contract GRI-5014-362-0291)
(PB82-180647; GRI-82/0006) Avail: NTIS HC A03/MF A01 CSCL 11F

The program objectives and approach for a microstructural study of the behavior of iron-chromium-nickel alloys under the combined effects of stress and corrosive species encountered in coal gasification is discussed. The work involves systematic study of the effects of variations in alloy and environment compositions. Included are oxidizing and sulfidizing gas compositions. Model alloys were procured and heat treated. In addition, microstructural changes which occur in 310 stainless steel, Incoloy 800H, RA 333 and IN 657 during stress rupture testing in a simulated coal gasification environment at 1500 F were examined. Optical metallography and energy dispersive X-ray analysis were used to characterize the microstructure. This characterization is continuing and a mechanism was proposed. GRA

N82-32484# Cambridge Univ. (England). Dept. of Engineering.
FRACTURE-MECHANISM MAPS FOR NICKEL, SILVER, ALUMINIUM AND LEAD AND CERTAIN OF THEIR ALLOYS
C. Gandhi, M. F. Ashby, and D. M. R. Taplin 1981 48 p refs
(PB82-179649; CUED/C-MATS/TR-49; ISSN-0309-6505) Avail: NTIS HC A03/MF A01 CSCL 11F

The mechanisms of fracture of round tensile specimens of a number of face centered cubic lattice metals and alloys and were studied and reviewed. New observations were combined with a

large body of published data and used to construct two types of fracture mechanism maps which summarize the behavior. Maps are shown for commercially pure nickel, Nichrome, a Monel, nickel-2% thoria, Nimonic-80A and Inconel X-750; for pure silve; for pure and commercial 2S-grade Aluminum and for RR-58; and for two grades of lead. Certain generalizations about fracture behavior can be drawn from comparisons of the maps. GRA

N82-32485# Cambridge Univ. (England). Dept. of Engineering.
FRACTURE-MECHANISM MAPS
M. F. Ashby 1981 73 p refs
(PB82-178609; CUEDC-MAT/TR-34; ISSN-0309-6505) Avail: NTIS HC A04/MF A01 CSCL 11F

The development of elementary fracture mechanism maps studied. These are diagrams with tensile stress as one axis and temperature as the other, showing the fields of dominance of a given micromechanism of fracture: cleavage, ductile fracture, rupture, intercrytalline creep fracture, and so on. Superimposed on the fields are contours of constant time-to-fracture. They can be constructed in either of two ways: empirically, by assembling observations and data for the fracture of a given material; and theoretically, via models for the individual fracture mechanisms. The two approaches complement each other; both are presented here. The maps give an overview of the micromechanisms by which a given material may fail, and help identify the one most likely to be dominant in a given experiment, or an engineering application. Author (GRA)

N82-32486# Bureau of Mines, Reno, Nev.
HYDROGEN CHLORIDE SPARGING CRYSTALLIZATION OF ALUMINUM CHLORIDE HEXAHYDRATE Report of Investigations, 1981
D. E. Shanks, J. A. Eisele, and D. J. Bauer Jan. 1982 21 p refs
(PB82-177056; BM-RI-8593) Avail: NTIS HC A02/MF A01 CSCL 11F

The hydrogen chloride gas-sparging crystallization of aluminum chloride hexahydrate (ACH) from aluminum chloride liquor was investigated to provide information for optimizing the crystallization operation. Four parameters important in controlling the crystallization of the aluminum chloride hexahydrate and the concentration of impurities, particularly phosphorus and magnesium, in ACH crystals are: (1) aluminum chloride concentration in the feed solution to crystallization, (2) hydrogen chloride gas flow rate, (3) temperature, and (4) concentration of phosphorus and magnesium also in the feed solution. Author (GRA)

N82-32487# Bureau of Mines, Twin Cities, Minn.
STEELS FROM A VARIETY OF FERROUS SCRAP INCLUDING MATERIALS OF LOW QUALITY
V. R. Spironello, I. D. Shah, and R. H. Nafziger Jan. 1982 21 p refs
(PB82-176959; BM-RI-8622; LC-81-607143) Avail: NTIS HC A02/MF A01 CSCL 11F

The recycling of the magnetic fraction of municipal solid waste called raw refuse scrap is discussed. Several types of scrap of differing quality, including refuse and turnings, were melted in a 1-ton electric arc furnace in various combinations to produce steel in noncritical (construction) grades. Information on furnace operation and on the behavior of tramp and alloying elements was obtained. The research showed that it is possible to produce acceptable steel from a variety of steel scrap. GRA

N82-32488# Bureau of Mines, Albany, Oreg. Research Center.
ELECTROWINNING NICKEL AND COBALT FROM DOMESTIC LATERITE PROCESSING. PRELIMINARY LABORATORY-SCALE RESULTS
R. E. Mussler and R. E. Siemens Jan. 1982 25 p refs
(PB82-176603; BM-RI-8604) Avail: NTIS HC A02/MF A01 CSCL 11F

A method for selectivity extracting nickel and cobalt from low grade domestic laterites was evaluated. Preliminary laboratory scale electrowinning tests conducted in both a nondiaphragm and a diaphragm cell to determine the effect of variables on energy efficiency under controlled conditions are described. Electrolytes were generally reagent grade sulfate solutions that were prepared to simulate electrolyte that could be obtained by stripping nickel and cobalt rich solvent extraction reagents. Limited tests were conducted with electrolyte generated from laterite leach solutions. GRA

N82-32489# Cambridge Univ. (England). Dept. of Engineering.
THE MECHANICS OF CELLULAR MATERIALS
L. J. Gibson, G. S. Schajer, C. I. Robertson, and M. F. Ashby Dec. 1980 79 p refs
(PB82-174806; CUED/C-MATS/TR-68; ISSN-0309-6505) Avail: NTIS HC A05/MF A01 CSCL 11F

The elastic and plastic properties of two dimensional cellular structures are analyzed mathematically. Theoretical expressions are derived for linear elastic, nonlinear elastic and plastic behavior. Experimental tests on silicon rubber models and aluminum honeycombs representing two dimensional cells are described and the results of deformation under stress compared with those predicted theoretically. Possible applications of the work to the design of honeycomb sandwich panels and packaging and to the understanding of three dimensional foams is briefly mentioned. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N82-32490*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HIGH PERFORMANCE FILLETING SEALANT Patent Application
Robert W. Rosser, Danute I. Basiulis (Hughes Aircraft Co.), and Darrell P. Salisbury, inventors (to NASA) (Hughes Aircraft Co.) Filed 1 Jul. 1982 21 p
(NASA-Case-ARC-11409-1; US-Patent-Appl-SN-394345) Avail: NTIS HC A02/MF A01 CSCL 11A

A filleting sealant having high performance characteristics is disclosed. The sealant is based on NASA-patented cyano- and diamidoximine-terminated perfluoroalkylene ether prepolymers that are thermally condensed and cross-linked. The sealant contains asbestos and, in its preferred embodiments, carbon black reinforcement and a silicone or epoxy adhesion promoter. The sealant was extensively evaluated by Hughes Aircraft Company. In the evaluation it showed excellent resistance to fuel and other solvents and was much more resistant than Viton. It showed no corrosive effect on the surface of titanium in long term testing at 288 deg C (550 deg F) and had good adhesion to aluminum and titanium. No deterioration of adhesive strength resulting from elevated temperature fuel aging was noted. Lap shear and tensile strength surpassed MIL specification requirements. The tensile strength and elongation of the sealant indicate a lightly cross linked system with a Tg of -30 deg C. The thermal stability by thermogravimetric analysis is excellent with onset of degradation occurring at 280 deg C. NASA

N82-32491*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OCCURRENCE OF SPHERICAL CERAMIC DEBRIS IN INDENTATION AND SLIDING CONTACT
Kazuhisa Miyoshi and Donald H. Buckley Aug. 1982 21 p refs
(NASA-TP-2048; E-1072; NAS 1.60:2048) Avail: NTIS HC A02/MF A01 CSCL 11G

Indenting experiments were conducted with the silicon carbide (0001) surface in contact with a spherical diamond indenter in air. Sliding friction experiments were also conducted with silicon carbide in contact with iron and iron-based binary alloys at room temperature and 800 C. Fracture pits with a spherical particle and spherical

wear debris were observed as a result of indenting and sliding. Spherical debris may be produced by a mechanism that involves a spherical-shaped fracture along the circular or spherical stress trajectories under the inelastic deformation zone. Author

N82-32492# State Univ. of New York, Stony Brook. Dept. of Chemistry.
CONFORMATION AND DYNAMICS OF POLYMERS IN SOLUTION Final Report, 1 Apr. 1979 - 31 Mar. 1982
Ben Chu 11 Jun. 1982 19 p refs
(Contract DAAG29-79-C-0069)
(AD-A116629; ARO-16426.12-CH) Avail: NTIS HC A02/MF A01 CSCL 11/9

A method for studying polymerization kinetics based on Raman scattering is presented. The method has selectivity, is reliable and easy to apply, can be automated, and is insensitive to most spurions phenomena. The method is demonstrated by a study of the thermal polymerization of styrene at 60, 75, and 90 C. Author

N82-32493# Arizona Univ., Tucson. Dept. of Chemistry.
NEW ACETYLENE-TERMINATED QUINOXALINE OLIGOMERS Final Report, 15 Aug. 1980 - 14 Nov. 1981
Koji Ishizu, Usha Devi G. Prabhu, Dan Draney, and C. S. Marvel Wright-Patterson AFB, Ohio AFWAL Mar. 1982 37 p refs
(Contract F33615-80-K-5166; AF Proj. 2419)
(AD-A115730; AFWAL-TR-82-4006) Avail: NTIS HC A03/MF A01 CSCL 11/9

A series of acetylene-terminated quinoxaline oligomers were synthesized by methods for using a minimum amount of tetraamine, the most expensive component in the system. Samples of the oligomers furnished to the materials laboratory for further study. Author

N82-32494# Dayton Univ., Ohio.
RAIN EROSION EVALUATION AND ANALYSIS OF SELECTED COATED MONOLITHIC POLYCARBONATE TRANSPARENCY MATERIALS Final Report, Jul. 1980 - Dec. 1981
Charles J. Hurley, Joseph Zahavi (Israel Inst. of Metals, Technion, Haifa), and George F. Schmitt (AFWAL) Wright-Patterson AFB, Ohio AFWAL May 1982 55 p
(Contracts F33615-78-C-5127; F33615-79-C-5129; AF Proj. 2422)
(AD-A115850; AFWAL-TR-82-4029) Avail: NTIS HC A04/MF A01 CSCL 11/3

This report documents a test program which was conducted to evaluate the rain erosion resistance of selected coated monolithic polycarbonate materials after being subjected to accelerated ultraviolet exposure and to evaluate the effect of exposure duration at 500 mph in a 1 inch/hour rainfall. Tests included: weight loss, haze measurements, percent coating removal and SEM examinations. Author (GRA)

N82-32495# Naval Air Development Center, Warminster, Pa.
WATER-BASED SOLID FILM LUBRICANTS Progress Report
Alfeo A. Conte, Jr. 27 Apr. 1982 24 p refs
(WF61542000)
(AD-A115860; NADC-81300-60) Avail: NTIS HC A02/MF A01 CSCL 11/8

This report presents the initial results of an investigation to develop high temperature 538 deg C (1000 deg F) and moderate temperature 260 deg C (500 deg F) range water-based solid film lubricants for naval aircraft applications. Lithium silicate films are shown to provide excellent water resistance compared to sodium silicate films; however, the poor permeability exhibited by lithium silicate films requires corrosion inhibition. An experimental strategy technique has been used to determine an optimum formulation for enhanced durability of this type of solid film lubricant. A significant increase in endurance life has been observed as a result of this approach. A limited investigation on the use of a water-dilutable organic resin bonded solid film lubricant is also reported. Author (GRA)

N82-32496# North Carolina State Univ., Raleigh.
FUNDAMENTAL INVESTIGATIONS IN POLYMER CHEMISTRY Final Report, 29 Jun. 1975 - 31 Mar. 1982
Vivian T. Stannett and David R. Squire 12 Jun. 1982 8 p
(Contract DAAG29-79-D-1003; Grants DAHC04-75-G-0090; DAAG29-76-G-0214; DAAG29-77-G-0136; DAAG29-79-G-001; ARO Proj. 13127-C; ARO Proj. 16144-C)
(AD-A116032; ARO-13127.7-CH; ARO-16144.8-CH) Avail: NTIS HC A02/MF A01 CSCL 07/4

Studies resulted in the first direct proof of chain transfer to solvent in the cationic polymerization of vinyl ethers by both chemical initiation and initiation using radiation. It was shown that incomplete dissociation of the initiator salt can influence the rate constant for polymerization by a factor of three or more. It was discovered that solvent effects can have remarkable effects upon the rate of polymerization. For example it was found that a linear relationship exists between the logarithms of the rate constants and the reciprocals of the dielectric constants. Results indicate that there is little or no solvation of the propagating species by monomer. In certain circumstances there could be a self-solvation of the propagating cations by their own chains. Progress on the radiation chemistry work on polyphosphazenes has moved slowly due to complicating factors caused by the broad and sometimes bimodal nature of the molecular weight distributions. Author (GRA)

N82-32497# California Univ., Berkeley. Dept. of Chemical Engineering.
TRANSIENT STRUCTURES AND RHEOLOGICAL PROPERTIES OF SBS BLOCK COPOLYMER MELTS Technical Report, 1 May 1981 - 8 Jun. 1982
Naomi Siashinsky, Tak Jin Moon, and David S. Soong 8 Jun. 1982 31 p refs Submitted for publication
(Contract N00014-81-K-0516)
(AD-A115927; TR-2) Avail: NTIS HC A03/MF A01 CSCL 11/9

Shear stress growth and relaxation behavior of two well-characterized SBS block copolymers has been studied using a Melt Elasticity Tester. Effects of casting solvents on the transient rheological properties and structure variation during flow are determined via samples cast from THF/MEK and cyclohexane. the temperature dependence of the observed shear stress at the yield point and steady-state viscosities provides insight into the mechanism of structure breakdown induced by the applied flow. Shear stress relaxation upon cessation of flow reveals complex behavior, depending on temperature, casting solvents and duration of previous flow. Strain recovery data have also been obtained, indicating strong dependence on the composition of the copolymers. Significance of these observations in terms of the melt structure of SBS is discussed. Author (GRA)

N82-32498# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Metallurgy and Materials Science.
OXIDATION OF NON-OXIDE CERAMICS Final Report, Feb. 1975 - Feb. 1982
T. E. Mitchell and A. H. Heuer 25 May 1982 22 p refs
(Contract F49620-78-C-0053; AF Proj. 2305)
(AD-A115947; AFOSR-82-0482TR) Avail: NTIS HC A02/MF A01 CSCL 11/2

Oxidation mechanisms of SiC were determined. It was found that cristobalite nucleates at the SiC/SiO2 interface with appreciable heterogeneous nucleation during the first hour. Identical oxidation mechanisms were found for both single crystal and sintered polycrystalline SiC. Oxidation of yttria stabilized silicon nitride was investigated to determine the cause of the catastrophic oxidation at 1000 C. At high temperature, SiO2 covers the entire surface, but at low temperature it does not. This allows the unstable yttria silicon oxynitride phases to form and cause catastrophic failure. No evidence of the effect of tungsten was noted. Author (GRA)

N82-32499# Ford Motor Co., Dearborn, Mich.
CERAMIC LIFE PREDICTION METHODOLOGY: HOT SPIN DISC LIFE PROGRAM Interim Report, 1 Oct. 1979 - 31 Dec. 1980
R. R. Baker, L. R. Swank, and J. C. Caverly Apr. 1982 43 p refs
(Contract DAAG46-77-C-0028; DA Proj. 1L1-62105-AH-84)

(AD-A117033; AMMRC-TR-82-26) Avail: NTIS HC A03/MF A01 CSCL 11/4

A rotating disc was designed to fail due to time dependent mechanisms. Several discs were fabricated and a previously existing test rig was developed to test the discs at the design conditions. A successful calibration test was conducted at the design condition of 2300 F rim temperature and 50,000 rpm. The disc failed after eight and one-half hours of steady state testing indicating that the design was successful, since the failure was due to a time dependent mechanism. Author (GRA)

N82-32500# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Chemistry.

PROPERTY-STRUCTURE-PROCESSING RELATIONS IN POLYMERIC MATERIALS Final Report

L. Yen, D. Meitz, H. Markovitz, and G. C. Berry 31 Jul. 1981 80 p refs

(Grant AF-AFOSR-3404-77; AF Proj. 2303)

(AD-A117262; AFOSR-82-0303TR) Avail: NTIS HC A05/MF A01 CSCL 07/4

In recent years, macromolecules with a rodlike chain conformation have been processed from liquid crystalline solutions to prepare fibers and sheets with exceptional stiffness and strength. In this study, the polymerization kinetics of a rodlike chain have been determined. The chain studied, poly(1,4 phenylene benzobisoxazole), PBO, is rigid and rodlike, forms liquid crystalline solutions, and can be fabricated to give high modulus fibers. The investigation showed that the effective reactivity of the chain decreased sharply with increasing chain length. Presumably, this reflects a diffusion-limited polymerization rate for the condensation of rigid rodlike chains; the reactive end group is not free to diffuse without corresponding motion of the entire molecule, in distinction to the situation with flexible-chain polymers. One result of the unusual polymerization kinetics is that the molecular weight distribution is unusually narrow for a step-growth polymer owing to the relative decrease in the production of long chains and the depletion of short chains in the overall population. The second part of this investigation was addressed to the rheological properties of polymeric fluids containing suspended particles. GRA

N82-32501# California Univ., Livermore. Lawrence Livermore Lab.

PROBLEMS IN PLASTIC ARE EASIER

Glynn A. Pence 30 Sep. 1981 5 p Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26-29 Oct. 1981

(Contract W-7405-eng-48)

(DE82-000748; UCRL-86107; CONF-811040-5) Avail: NTIS HC A02/MF A01

The Mirror Fusion Test Facility uses plastic models to lay out their systems which are to be built. By using this mechanism, installation problems are minimized and space utilization is improved. Several factors are considered and mechanisms used when building a model for system design: (1) scale to be used; (2) amount of detail to be included; (3) mechanism for reporting interferences; and (4) changing the model. Each of the items is discussed and recommendations are made for utilizing models more effectively in developing experimental systems. Recommendations include model reviews and visibility of the model. DOE

N82-32502# Bayer A.G., Leverkusen (West Germany). Zentralbereich Forschung und Entwicklung.

PATHS OF DEACTIVATION OF LIGHT-INDUCED REACTIVE STATES OF ADDITIVES IN POLYMERS Final Report, Sep. 1980

Uwe Claussen Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 35 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-81-046; ISSN-0170-1339) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 7,30

Light induced reactivity in a solution and in polymers was studied experimentally. While in a solution all solute molecules are coordinated with solvent molecules in an identical manner, this does not hold for the same solute or additive in a polymer matrix. This causes differing solvation, i.e., an isomeric complexing of the additive by the polymer chain. This hypothesis was tested. The influence of the surrounding polymer chains on the chemical and spectral behavior of additives was observed. Since the complexing depends on the paths along which the additive is distributed, it was difficult to obtain reproducible results. A Spacelab experiment is suggested. Author (ESA)

N82-32503# Battelle Columbus Labs., Ohio.

EFFECTS OF LOADS ON THE STRUCTURAL AND FRACTURE BEHAVIOR OF POLYOLEFIN GAS PIPING Report, Jan. 1975 - Jun. 1980

F. S. Uralil, C. S. Lee, R. L. Markham, and M. M. Epstein Dec. 1981 158 p refs

(Contract GRI-5014-352-0152)

(PB82-180654; GRI-80/0045) Avail: NTIS HC A08/MF A01 CSCL 11I

Static and fatigue loading were used to simulate the external mechnical loads on polyolefin socket and butt fusion joints. Static loading modes include axial loading, constant deflection in bending, constant moment in bending, and point loading. Early failures are obtained with materials known to perform poorly in the field. As expected the rotary fatigue test yielded earlier failures than static tests although the method needs refinement. Tests for measuring specific fracture energy, stress intensification, and fracture toughness parameter were developed, and these properties were measured on a variety of polyolefin materials. It is shown that resistance to crack initiation and propagation are quite variable among polyolefin piping materials and for polyethylenes correlates for the most part with independent measurements of environmental stress crack resistance. Studies of fracture surfaces suggest that morphological details are a function of test conditions such as crack speed; temperature, etc. Author

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N82-32504*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CHARACTERIZATION OF AN EXPERIMENTAL REFEREE BROADENED SPECIFICATION (ERBS) AVIATION TURBINE FUEL AND ERBS FUEL BLENDS

Gary T. Seng Aug. 1982 25 p refs

(NASA-TM-82883; E-1260; NAS 1.15:82883) Avail: NTIS HC A02/MF A01 CSCL 21D

Characterization data and comparisons of these data are presented for three individual lots of a research test fuel designated as an Experimental Referee Broadened Specification (ERBS) aviation turbine fuel. This research fuel, which is a blend of kerosene and hydrotreated catalytic gas oil, is a representation of a kerojet fuel with broadened properties. To lower the hydrogen content of the ERBS fuel, a blending stock, composed of xylene bottoms and hydrotreated catalytic gas oil, was developed and employed to produce two different ERBS fuel blends. The ERBS fuel blends and the blending stock were also characterized and the results for the blends are compared to those of the original ERBS fuel. The characterization results indicate that with the exception of the freezing point for ERBS lot 2, which was slightly high, the three lots, produced over a 2 year period, met all general fuel requirements. However, although the properties of the fuels were found to be fairly consistent, there were differences in composition. Similarly, all major requirements for the ERBS fuel blends were met or closely approached, and the properties of the blended fuels were found to generally reflect those expected for

the proportions of ERBS fuel and blending stock used in their production. Author

N82-32505# Systems Technology Corp., Xenia, Ohio.
PHYSICAL CHARACTERISTICS OF DENSIFIED REFUSE DERIVED FUEL AND THEIR IMPACT ON FLOW PROPERTIES Final Report
Ned J. Kleinhenz, Anslie N. Collishaw, and Richard J. Singer Champaign, Ill. Army Construction Engineering Research Lab. May 1982 42 p
(Contract DACA88-81-C-0002; DA Proj. 4A7-61102-AT-23)
(AD-A116392; CERL-TR-E-178) Avail: NTIS HC A03/MF A01 CSCL 21/4

This project was performed to determine which properties of densified refuse derived fuel (dRDF) have a significant impact on its flow characteristics within bins, hoppers, and silos. The properties of moisture content, size distribution, and fines content were investigated. Flow characteristics were evaluated in terms of funnel angle and bulk shear strength. This analysis showed that flow angle was the most sensitive characteristic for indicating how easily a material flows. Although the test plan did not include using bulk density as a flow characteristic, an analysis showed a correlation between bulk density and funnel angle. However, ease of flow is more sensitive to funnel angle than to bulk density. No useful relationship between bulk shear strength and flow angle was observed. Therefore, bulk shear strength should not be used to evaluate the effects of dRDF flow properties. Since funnel angle best indicates how much material will flow through a hopper, each dRDF property was evaluated in terms of its effect on funnel angle. Of the properties investigated, the amount of fines in the sample was found to have the greatest effect on funnel angle. As the amount of fines was increased from 0 to 30%, the funnel angle increased steadily. Moisture content showed less influence, with results indicating that increasing moisture increased flow angle. It was also observed that moisture content may permanently affect a sample's flow capabilities. Therefore, the moisture history of the dRDF may directly affect its flow capability. No significant effect on funnel angle could be associated with the size distribution of the pellets except for fines content. Author (GRA)

N82-32506# Naval Weapons Center, China Lake, Calif.
SYNTHESIS OF A NEW EXPLOSIVE COMPOUND, TRANS-1,4,5,8-TETRANITRO-1,4,5,8,-TETRAAZADECALIN Final Report, 1 Jun. 1980 - 31 May 1981
Rodney L. Willer Aug. 1981 16 p refs
(AD-A116666; AD-E450017; NWC-TP-6303) Avail: NTIS HC A02/MF A01 CSCL 19/1

The synthesis of a new explosive compound, trans-1,4,5,8-tetranitro-1,4,5,8-tetraazadecalin, is described. The compound has several physical properties which are superior to those of HDX (1,3,5,7-tetranitro-1,3,5,7-tetraazacyclooctane) and RDX (1,3,5-trinitro-1,3,5-hexahydrotriazine). These superior physical properties include heat stability and insensitivity to impact. GRA

N82-32507# Air Force Office of Scientific Research, Bolling AFB, Washington, D.C.
PROCEEDINGS OF THE 1982 AFOSR/AFRPL ROCKET PROPULSION RESEARCH MEETING Interim Report, Mar. 1981 - Feb. 1982
Leonard H. Caveny, ed. and David M. Mann, ed. Feb. 1982 133 p Proceedings held at Lancaster, Calif., 2 - 4 Mar. 1982; sponsored by AFOSR and AFRPL
(AF Proj. 2308; AF Proj. 2307)
(AD-A116080; AFOSR-82-0507TR) Avail: NTIS HC A07/MF A01 CSCL 21/9

This document contains expanded abstracts from the 1982 meeting on the Air Force basic research program on energy conversion relating to rocket propulsion. The meeting (Lancaster, CA on 2-4 March 1982) presented research supported by both the Air Force Office of Scientific Research and the Air Force Rocket Propulsion Laboratory. Major topics included: diagnostics of reacting flows, combustion, chemical kinetics, thermal properties, propulsion concepts, energetic materials, material and propellant ingredients, exhaust plumes, transition to detonation, combustion stability, structural mechanics. Author (GRA)

N82-32508# Computer Sciences Corp., Bay St. Louis, Miss. Technical Services Lab.
TNT EQUIVALENCY OF RDX
L. Mars, D. Westover (Army Armament Research and Development Command), and J. Caltagirone (Army Armament Research and Development Command) Dover, N.J. Army Armament Research and Development Command Jun. 1982 45 p refs
(Contract MIPR-8311-0089)
(AD-A115610; AD-E400846; ARLCD-CR-82022) Avail: NTIS HC A03/MF A01 CSCL 19/1

Peak side-on blast overpressure and scaled positive impulse have been measured for RDX using configurations typical in a manufacturing facility. Quantities of 22.68 kg (50 lb), 45.36 kg (100 lb), 27.22 kg (60 lb), and 54.43 kg (120 lb) were tested in simulated shipping drums and simulated Nutsche containers. High explosive equivalency values for each test size were obtained as a function of scaled distance by comparison to known pressure and impulse characteristics for TNT surface bursts. Author (GRA)

N82-32509# Aerojet Strategic Propulsion Co., Sacramento, Calif. Chemical Research and Development Dept.
LINER TECHNOLOGY PROGRAM. VOLUME 3: LINER DEVELOPMENT METHODOLOGY MANUAL Final Technical Report, Aug. 1978 - Nov. 1981
David O. DePree, Arthur Katzakian, James A. Klier, and Roger B. Steele May 1982 99 p 3 Vol.
(Contract F04611-78-C-0076; AF Proj. 5730)
(AD-A115978; AFRPL-TR-81-099-Vol-3) Avail: NTIS HC A05/MF A01 CSCL 21/9

This manual provides a systematic methodology for formulating, evaluating, and developing liners to fit various propellant/insulation and solid rocket motor environment requirements. GRA

N82-32510# Aerojet Strategic Propulsion Co., Sacramento, Calif. Chemical Research and Development Dept.
LINER TECHNOLOGY PROGRAM. VOLUME 1: FRACTURE ENERGY METHOD DEVELOPMENT Final Report, Aug. 1978 - Nov. 1981
Kenneth W. Bills, Jr. and Richard A. Schapery May 1982 290 p refs 3 Vol.
(Contract F04611-78-C-0076; AF Proj. 5730)
(AD-A115977; AFRPL-TR-81-097-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 21/9

The objective was to develop a test method for the measurement of adhesive and cohesive fracture energy in a form that would permit the evaluation in engineering terms of the propellant liner bondline. After screening existing test specimens, the scarf-joint specimen was selected as the one that most closely met the AFRPL criteria. The J integral fracture criterion was extended to account for the nonliner viscoelastic effects of solid propellants and theoretically applied to the analysis of this test. The test specimen was optimized using 1-, 2- and 3-dimensional stress analyses plus simple experimental evaluations. Experiments included tests under superimposed pressures, combined tension and shear, and simultaneous cooling and deformation. Comparisons were made with other test methods and on specimens cut from motors. Author

N82-32511# Princeton Combustion Research Labs., Inc., N.J.
SENSITIVITY OF LIQUID MONOPROPELLANTS TO COMPRESSION IGNITION Final Report, Nov. 1980 - Jul. 1981
N. A. Messina, L. S. Ingram, and M. Summerfield Aberdeen Proving Ground, Md. ARBRL Jun. 1982 70 p refs
(Contract DAAK11-81-C-0012)
(AD-A115842; AD-F300054; ARBRL-CR-00482; PCRL-FR-81-005) Avail: NTIS HC A04/MF A01 CSCL 19/1

Safe start up and operation of a liquid propellant gun system can be accomplished if the relevant sensitivity parameters or hazard parameters of the candidate monopropellant as related to secondary ignition effects in the LPG environment can be identified and

measured. Here we define secondary ignition as any propellant ignitions due to sources other than direct initiation. Flow factors, ignition reaction factors, pressure development, and confinement times all contribute in defining this regime of safe operation of the liquid monopropellant system. The secondary ignition event that we have focused on in this study is the collapse of a bubble under rapid compression of the liquid monopropellant charge. The particular propellant utilized in all tests was NOS-365. In this study, Princeton Combustion Research Laboratories, Inc., has utilized its Compression Ignition Sensitivity Tester, with minor modifications, to produce on a systematic basis rapid compression of the liquid monopropellant charge with various rates of pressure rise, with various amounts of finely distributed ullage, with and without pre-pressurization of the propellant charge, to determine operating domains of safe start-up operation insofar as avoidance of compression ignition due to entrapped bubble collapse is concerned. GRA

N82-32512# SRI International Corp., Menlo Park, Calif.
ANALYSIS AND ENVIRONMENTAL FATE OF AIR FORCE DISTILLATE AND HIGH DENSITY FUELS Final Report, Aug. 1980 - Oct. 1981
J. H. Smith, J. C. Harper, and H. Jaber Tyndall AFB, Fla. Air Force Engineering and Services Center Oct. 1981 159 p refs
(Contract F08635-80-C-0122; AF Proj. 1900)
(AD-A115949; AFESC/ESL-TR-81-43) Avail: NTIS HC A08/MF A01 CSCL 21/4

Five high density fuels (RJ-4, RJ-5, RJ-6, JP-9, and JP-10) and three distillate fuels were analyzed by capillary column gas chromatography (GC). The major components of the distillate fuels were identified by gas chromatography-mass spectrometry (GC-MS). The molecular weight of the isomers of the high density fuel components were also determined, but the structures of only a few components were assigned by comparing the GC retention times with authentic samples. The concentration and identity of the major water-soluble fuel components were also identified. The volatilization rates of the water-soluble components of JP-4, JP-8, and JP-9 were measured by preparing solutions of the fuel components in water, stirring at three stirring rates, and measuring the rate of decrease of the concentration of each component by GC as a function of time. The water-soluble components of JP-4 were photolyzed for 21 days in sunlight in deionized water, natural seawater, and water from a local pond. The distribution of the fuel components was estimated, using the method recently proposed by Mackay and Patterson. The alkanes should partition almost entirely into the atmosphere, the monoaromatics should be in both the air and water, and the naphthalene should partition into the water and the sediment phases. Adsorption of the alkanes and monoaromatics should not be a major environmental fate. It is recommended that the rate of dissolution in water and evaporation of the pure fuels be studied in detail because they may be the rate-limiting transport processes. GRA

N82-32513# Coordinating Research Council, Inc., Atlanta, Ga. Analysis Panel.
THE 1981 CRC ALTITUDE OCTANE REQUIREMENT PROGRAM
Dec. 1981 64 p refs
(Contract DAAK70-81-C-0128; CRC Proj. CM-124-81)
(AD-A116988; CRC-523) Avail: NTIS HC A04/MF A01 CSCL 21/4

The effect of altitude on octane requirements of 1981 model automobiles equipped with electronic systems for controlling air-fuel mixture and spark timing is reported. J.D.

N82-32514# Helstad (Scott), La Crosse, Wisc.
ALCOHOL PRODUCTION FROM CHEESE, WHEY AND CORN FOR A FARM-SIZE OPERATION Final Report, Jul. - Dec. 1981
Scott Helstad 24 Dec. 1981 35 p
(Contract DE-FG02-81AF-92018)
(DE82-010534; DOE/AF-92018/2) Avail: NTIS HC A03/MF A01

The goal of this project was to construct a farm size alcohol distillery, capable of producing 200,000 gallons per year of equivalent 200 proof alcohol that is both labor and energy efficient. The distillery was completed in October and was operated on a weekly basis. It has taken until mid-November to work many of the bugs out. This operation is now capable of demonstrating the energy comsumption and economics of producing alcohol on a small scale. The data and conclusions that can be made from results achieved so far are: (1) a batch process can be energy efficient if it operates at an optimum level; (2) the cost of producing alcohol in small batch operations is likely to be prohibitive; and (3) it is doubtful a farmer could construct a small, efficient distillery alone. GRA

N82-32515# Santa Clara Univ., Calif.
CHARACTERIZATION AND RESEARCH INVESTIGATION OF ALCOHOL FUELS IN AUTOMOBILE ENGINES
L. H. Browning, ed. and J. F. Nebolon, comp. Feb. 1982 193 p refs
(Contract DE-AC03-78CS-51737)
(DE82-009350; DOE/CS-51737/1) Avail: NTIS HC A09/MF A01

The use of pure methanol and ethanol in spark ignition engines is evaluated. Engine and fuel/air induction system modifications, acoustic induction system, dynamometer testing, cold start experiments, fleet tests using neat alcohol fuels and fuel blends, thermokinetic combustion process modeling, smog formation studies, and an evaluation of environmental and health hazards are discussed. The combustion modeling studies revealed that higher compression ratios can be exploited to enhance power and efficiency without paying an NO sub x penalty. Methanol thermally ignites more easily than gasoline. The study indicates that as much as 30% water can be added to the methanol substantially reducing NO sub x emissions without diminishing power or thermal efficiency. However, this achievement is accompanied with increased hydrocarbon and aldehyde emissions. Electric heaters can overcome cold starting problems in mild climates. These heaters plus fuel additives are most effective for very cold climates. Engine optimization for alcohols is still in an early stage of development. DOE

N82-32516# Raytheon Service Co., Burlington, Mass.
FEASIBILITY STUDY FOR ALTERNATIVE-FUELS PRODUCTION FROM SOLID WASTE
Jerry W. Temple and John F. Leonard Feb. 1982 107 p
(Contract DE-FG01-80RA-50375)
(DE82-008084; DOE/RA-50375/1) Avail: NTIS HC A06/MF A01

The objective of the project was to evaluate the feasibility of producing refuse-derived fuel (RDF) at an existing shredding station in Charleston, South Carolina, and selling this product to local industry to replace fossil and wood-products fuels currently utilized. During the study, a complete survey of significant energy consumers in Charleston was conducted. Of 77 consumers contacted, full-scale testing was carried out at the two facilities offering the greatest potential to purchase all the fuel which could be produced. At this time, negotiations are ongoing with a large paper producer with respect to the purchase of all the RDF could be produced over a 20-year period. Although the proposal for the grant anticipated either loan guarantees or price supports, which would significantly improve the overall feasibility of the project, there is still a reasonable chance that the project will proceed. Environmental considerations, the present disposal systems, system definitions, and capital costs and operating costs are discussed. GRA

N82-32517# Department of Energy, Bartlesville, Okla. Energy Technology Center.
USER'S GUIDE FOR THE ALTERNATIVE-FUEL DATA BANK
Feb. 1982 56 p
(DE82-008254; DOE/BETC-SP-81/7) Avail: NTIS HC A04/MF A01

An information system that is designed to provide rapid access to information concerning alternative fuels for transportation uses is described. This information system operates on the PDP-11/70 computer. The Alternative Fuels Data Bank (AFDB) consists of

three files that contain bibliographical information on publications and summaries of current research activities. The data stored in these files deal with the use of fuels from nonpetroleum sources and nonconventional fuels from petroleum sources in transportation applications. The computer programs serve as a data base management system that manipulates data in the files (that is, stores, changes, and deletes the data) and retrieves it as required to produce printed reports. The only equipment needed, besides the manual, are a telephone and remote access terminal. The AFDB is open to the research community at no cost. A brief history and description of the AFDB are provided. DOE

N82-32518# Purdue Univ., Lafayette, Ind.
PERFORMANCE OF SRC II FUELS IN GAS-TURBINE COMBUSTORS. ALTERNATIVE-FUELS-UTILIZATION PROGRAM
E. H. Tong and A. M. Mellor Dec. 1981 115 p refs
(Contract DE-AC02-80CS-50098)
(DE82-010471; DOE/CS-50098/1) Avail: NTIS HC A06/MF A01

Jet A, SRCII-Middle Distillate (SRCII-MD), and a 50/50 Jet A/SRCII-MD blend were burned in three different laboratory combustion rigs to study fuel property effects on combustion performance. Soot concentration, flame radiation, combustion efficiency and flame stabilization measurements were conducted in test rigs simulating conventional and prechamber geometry gas turbine combustors. A special ignition rig was used to study ignition performance. SRCII fuel's soot concentrations and flame radiation intensities were higher than those for Jet A. Generally the 50/50 blend behaved more like the SRCII-MD than the Jet A in these areas. Exhaust plane soot concentrations and average flame radiation intensities were found to correlate with hydrogen content, although the latter showed an equivalence ration dependence. For experimentally determined weak extinction limits and minimum ignition energies, comparisons were made with predictions based on characteristic time models that had been developed and verified for petroleum fuels. From this work, compositional fuel properties appeared to have secondary effects on both stabilization and ignition performance. Combustion efficiency results indicated higher efficiencies for the SRCII-MD than for the blend. However, this was thought to be due to sampling difficulties caused by the ingestion of liquid fuel into the sampling line. DOE

N82-32519# Technical Research Centre of Finland, Espoo. Fuel and Lubricant Research Lab.
UTILIZATION AND PROCESSING OF FOREST ENERGY. PART 3. EQUIPMENT TECHNIQUES OF BIOMASS PELLETIZATION
Matti Kytoe and Martti Aeijaelae 1982 52 p refs Transl. into ENGLISH from the mono. "Metsaeenergian Kaeytto ja Jalostus" Espoo, Mar. 1981
(PB82-154493) Avail: NTIS HC A04/MF A01 CSCL 21D

Drying and densification of biomass to homogeneous pellets or briquettes improves its calorific value and reduces storage and handling costs. Techniques used for pelletizing wood and peat are largely based on that of fodder pelletization. Densification techniques are investigated. In addition to ram presses and screw extruders, roll presses are also used for briquetting. In these the raw material is compressed to briquettes between two patterned rotating roll rings. The capacity of the biggest roll presses is as high as 50 t/h for briquetting brown coal. GRA

N82-32520# Brown and Caldwell, Walnut Creek, Calif.
UNITED PACKING: ALCOHOL FEASIBILITY STUDY Final Report
Oct. 1981 83 p Sponsored in part by California State Solid Waste Management Board
(PB82-178476) Avail: NTIS HC A05/MF A01 CSCL 21D

Cull fruit contains significant amounts of sugar which can be converted into ethanol using current technology. The ethanol has several uses one of which is a fuel to provide on-site energy for plant processing needs. Ethanol production is only one part in an overall energy management plan for the plant that is discussed. Cogeneration and other power production options utilizing ethanol, to provide both total and partial energy independence from utilities are also examined. Information from the alcohol production evaluation, energy survey, biomass profile, and power production analysis is integrated, and an overall energy management plan is defined. GRA

N82-32521# Bureau of Mines, Amarillo, Tex. Div. of Helium Operations.
ANALYSES OF NATURAL GASES, 1980 Information Circular, 1981
Billy J. Moore Jan. 1982 242 p refs
(PB82-178849; BUMINES-IC-8856) Avail: NTIS HC A11/MF A01 CSCL 21D

Analyses and related source data for 675 natural gas samples from wells and pipelines in 24 States and 5 foreign countries are presented. All of these samples were collected as a part of investigations of the occurrences of helium in natural gases of countries with free market economies. The analyses were made by mass spectrometer and a special helium analysis apparatus. GRA

N82-32522# Environmental Protection Agency, Ann Arbor, Mich. Standards Development and Support Branch.
INDIRECT LIQUEFACTION PROCESSES
John McGuckin Feb. 1982 79 p refs
(PB82-179755; EPA-AA-SDSB-82-5) Avail: NTIS HC A05/MF A01 CSCL 21D

The technology feasibility of the various coal gasification and indirect liquefaction technologies are discussed. Also included is the best-estimate costs for methanol and gasoline using the various technologies with three different coal feedstocks by critically analyzing publicity available design studies and placing them on a common technical basis. The conclusion is that ethanol from coal is cheaper than gasoline via either the Mobile MTG process or the Fisher-Tropsch process. GRA

N82-32523# Pennsylvania State Univ., University Park.
IMPORTANCE OF ACTIVE SITES FOR CHAR GASIFICATION IN OXYGEN (AIR) AND CARBON DIOXIDE Annual Report, Oct. 1980 - Sep. 1981
P. L. Walker, Jr., R. G. Jenkins, and L. R. Radovic Oct. 1981 53 p refs
(Contract GRI-5014-363-0235)
(PB82-180621; GRI-81/0018) Avail: NTIS HC A06/MF A01 CSCL 21D

The reactivities of chars, obtained by rapid and slow pyrolysis of raw and suitably pretreated North Dakota lignite under widely varying conditions of temperature, heating rate and residence time, were measured using thermogravimetric analysis. The pretreatment involved coal demineralization, ion exchange with ammonium acetate, and subsequently ion exchange with calcium acetate. In order to preserve the structure of the chars obtained by rapid pyrolysis, air was used as the reactant at low temperatures in the range 250 to 450C. Small amounts of sample (1-2 mg) were used in order to eliminate the effects of nonisothermal behavior and interparticle diffusional limitations on the observed kinetics. Major reactivity differences were observed as a function of pyrolysis residence time and the type of coal pretreatment used. GRA

N82-32524# ESCOR, Inc., Northfield, Ill.
LANDFILL METHANE RECOVERY. PART 1: ENVIRONMENTAL IMPACTS Final Report, Sep. 1980 - Sep. 1981
R. Eric Zimmerman and M. E. Goodkind Oct. 1981 100 p refs
(Contract GRI-5080-351-0343)
(PB82-181298; GRI-80/0084-Pt-1) Avail: NTIS HC A05/MF A01 CSCL 21D

The potential environmental and safety impacts of landfill methane recovery are discussed. The conclusion is that the range of uses for landfill gas and relative simplicity of the supply process make this technology suitable for investigation by both private industry and public utilities. The environmental and safety issues of most concern are those that exist because of uncertanties in the effects of human exposure to gas contaminants and also due to lack of data on possible contaminants in the gas. Research

recommendations were directed toward reduction of these uncertainties. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N82-32525# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION DIGEST, VOLUME 14, NO. 3 Monthly Report
Ronald Eshleman, ed., Judith Nagle-Eshleman, ed., and Milda Z. Tamulionis, ed. Mar. 1982 84 p refs
(AD-A112586) Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Random wave propagation in solid media is discussed. A literature review of mechanical face seal dynamics is presented, experimental observations and theoretical analyses are summarized. A literature review is also presented on subsynchronous vibration of rotor systems. For individual titles, see N82-32526 through N82-32528.

N82-32526# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.
RANDOM WAVES IN SOLID MEDIA c32
A. I. Beltzer *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14. No. 3 Mar. 1982 p 3-6 refs (For primary document see N82-32525 23-31)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/14

Random wave propagation in regular (nonrandom) solid media is discussed. Basic problems are formulated and results obtained. Applications in the mechanics of composite materials, acoustic emission, and earthquake engineering are discussed. B.W.

N82-32527# Technion - Israel Inst. of Tech., Haifa. Dept. of Mechanical Engineering.
A REVIEW OF MECHANICAL FACE SEAL DYNAMICS c37
I. Etsion *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 3 Mar. 1982 p 9-14 refs (For primary document see N82-32525 23-31)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 11/1

A literature review of mechanical face seal dynamics is presented; experimental observations and theoretical analyses are summarized. The contribution of various elements of the seal to its dynamic behavior is discussed; the difficulties of analyzing seal dynamics are pointed out. Author

N82-32528# Mechanical Technology, Inc., Latham, N. Y.
SUBSYNCHRONOUS VIBRATIONS OF ROTOR SYSTEMS c39
S. B. Malanoski *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 3 Mar. 1982 p 15-21 refs (For primary document see N82-32525 23-31)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

Subsynchronous vibration of rotor systems. Experimental and analytical studies cover various mechanisms for this instability that can be introduced by hydrodynamics bearings, high pressure fluid seals, labyrinth seals, and working fluids. Papers on practical experience for stability control are cited. B.W.

N82-32529*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE TELECOMMUNICATIONS AND DATA ACQUISITION REPORT Progress Report, May - Jun. 1982
N. A. Renzetti, ed. 15 Aug. 1982 216 p refs Sponsored by NASA
(NASA-CR-169328; NAS 1.26:169328; JPL-PR-42-70) Avail: NTIS HC A10/MF A01 CSCL 05B

Developments in Earth-based radio technology affecting space communications, geodynamics, and astrophysics are discussed. For individual titles, see N82-32530 through N82-32549.

N82-32530*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MONITOR AND CONTROL EQUIPMENT FOR THE MV-3 MOBILE VERY LONG BASELINE INTERFEROMETRY STATION c35
R. W. Sniffin *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 1-7 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 14B

The system, designed around a commercially available process controller, is described. The hardware design, selection of the process control equipment, the design of the interface to other systems, and the analog monitor and process control assembly used to operate the equipment from the MV-3 central computer are discussed. J.D.

N82-32531*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DSN COMMAND SYSTEM MARK IV-85 c32
H. C. Thorman *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 8-15 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 17B

A functional description of command subsystem software modifications providing computer-controlled prepass data transfer, validation tests, and revised displays are described. The Mark 4-A implementation schedule is presented and subsystems configurations for the Mark 4-85 system summarized. J.D.

N82-32532*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE DSN VLBI SYSTEM MARK IV-86 c32
W. D. Chaney *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 16-20 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 17B

Use of the system for wide channel bandwidth very long base interferometry is described. System requirements, description, and implementation plans are given. J.D.

N82-32533*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEEP SPACE PAYLOAD LAUNCHES VIA THE SPACE TRANSPORTATION SYSTEM c12
A. L. Berman, W. E. Larkin, and J. C. McKinney *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 21-36 ref (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 22A

The launching of deep space payloads via the Space Shuttle vehicle of the Space Transportation System, rather than via expendable launch vehicles, is described. Changes in procedures and data flow configurations for both the flight project and DSN during the launch period are required. A typical Galileo launch period sequence of events and telemetry and command data flow configurations are described. J.D.

N82-32534*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A STRUCTURE FUNCTION REPRESENTATION THEOREM WITH APPLICATIONS TO FREQUENCY STABILITY ESTIMATION c64
C. A. Greenhall *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 37-46 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 12A

Random processes with stationary nth differences serve as models for oscillator phase noise. A theorem which obtains the structure function (covariance of the nth differences) of such a process in terms of the differences of a single function of one time variable is proven. In turn, this function can easily be obtained from the spectral density of the process. The theorem is used for

computing the variance of two estimators of frequency stability.
Author

N82-32535*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PPM DEMODULATION FOR REED-SOLOMON DECODING FOR THE OPTICAL SPACE CHANNEL c32
D. Divsalar, R. M. Gagliardi, and J. H. Yuen *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 47-59 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 17B

The use of Reed-Solomon (RS) block codes over the pulse position modulated (PPM) frames to obtain the largest degree of error correction is considered. Since RS codes can correct both symbol errors and symbol erasures, a question arises as to the best way to demodulate the PPM laser fields in order to generate the input symbols for the RS decoder. The method selected for demodulating (converting the received laser field to digital symbols) defines the erasure and transmitted symbols of the laser link, and therefore determines the work error probabilities of the system. Several demodulating schemes are considered, and the effect of each on RS decoding performance computed. This computation was carried out for various optical receiver models. It is shown that simple threshold decisioning of pulse slots produces performance that degrades as the background noise increases. This is caused by the generation of too many erasures for the RS decoder to handle. A decision scheme, delta-max demodulation which offers improvement over threshold decisioning by redefining the generation of an erasure is proposed. J.D.

N82-32536*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A PARALLEL VLSI ARCHITECTURE FOR A DIGITAL FILTER OF ARBITRARY LENGTH USING FERMAT NUMBER TRANSFORMS c64
T. K. Truong, I. S. Reed, C. S. Yeh, and H. M. Shao *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982, p 60-71 refs Prepared in cooperation with Univ. of Southern California, Pasadena (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 12A

A parallel architecture for computation of the linear convolution of two sequences of arbitrary lengths using the Fermat number transform (FNT) is described. In particular a pipeline structure is designed to compute a 128-point FNT. In this FNT, only additions and bit rotations are required. A standard barrel shifter circuit is modified so that it performs the required bit rotation operation. The overlap-save method is generalized for the FNT to compute a linear convolution of arbitrary length. A parallel architecture is developed to realize this type of overlap-save method using one FNT and several inverse FNTs of 128 points. The generalized overlap save method alleviates the usual dynamic range limitation in FNTs of long transform lengths. Its architecture is regular, simple, and expandable, and therefore naturally suitable for VLSI implementation. Author

N82-32537*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE VLSI DESIGN OF A REED-SOLOMON ENCODER USING BERLEKAMPS BIT-SERIAL MULTIPLIER ALGORITHM c64
T. K. Truong, L. J. Deutsch, I. S. Reed, I.-S. Hsu, K. Wang, and C.-S. Yeh *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 72-86 refs Prepared in cooperation with Univ. of Southern California, Pasadena (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 12A

Realization of a bit-serial multiplication algorithm for the encoding of Reed-Solomon (RS) codes on a single VLSI chip using NMOS technology is demonstrated to be feasible. A dual basis (255, 223) over a Galois field is used. The conventional RS encoder for long codes ofter requires look-up tables to perform the multiplication of two field elements. Berlekamp's algorithm requires only shifting and exclusive-OR operations. J. D.

N82-32538*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
POWER COMBINING OF SEMICONDUCTOR LASERS: A REVIEW c36
J. Katz *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 87-94 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 20E

Several methods of coherent power combining are described and compared. A comparison is also made between coherent and incoherent power combining, and important operational characteristics are considered. It is found that in communication links with demanding requirements coherent power combining is necessary. Author

N82-32539*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE 2.5 BIT/DETECTED PHOTON DEMONSTRATION PROGRAM: PHASE 2 AND 3 EXPERIMENTAL RESULTS c32
J. Katz *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 95-104 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 17B

The experimental program for laboratory demonstration of and energy efficient optical communication channel operating at a rate of 2.5 bits/detected photon is described. Results of the uncoded PPM channel performance are presented. It is indicated that the throughput efficiency can be achieved not only with a Reed-Solomon code as originally predicted, but with a less complex code as well. E.A.K.

N82-32540*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A NOTE ON DEEP SPACE OPTICAL COMMUNICATION LINK PARAMETERS c32
S. J. Dolinar and J. H. Yuen *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 105-109 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 17B

Topical communication in the context of a deep space communication link. Communication link analysis at the optical frequencies differs significantly from that at microwave frequencies such as the traditional S and X-bands used in deep space applications, due to the different technology of transmitter, antenna, modulators, and receivers. In addition, the important role of quantum noise in limiting system performance is quite different than that of thermal noise. The optical link design is put in a design control table format similar to a microwave telecom link design. Key considerations unique to the optical link are discussed. E.A.K.

N82-32541*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THERMAL ANALYSIS OF ANTENNA BACKUP STRUCTURE. PART 1. METHODOLOGY DEVELOPMENT c32
D. Schonfeld and F. L. Lansing *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 110-116 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 20N

An analytic method was devised to predict the temperature distribution in typical antenna structural back-up members. The results are in agreement with those obtained by a numerical shooting method. The analytic method shows potential in simplifying the thermal analysis process for complex back-up antenna structures. E.A.K.

N82-32542*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PERFORMANCE OF AN OPTICAL RELAY SATELLITE USING REED-SOLOMON CODING OVER A CASCADED OPTICAL PPM AND BPSK CHANNEL c32
D. Divsalar and F. Naderi *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 117-131 refs (For primary

document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 17B

The nature of the optical/microwave interface aboard the relay satellite is considered. To allow for the maximum system flexibility, without overburdening either the optical or RF channel, demodulating the optical on board the relay satellite but leaving the optical channel decoding to be performed at the ground station is examined. The occurrence of erasures in the optical channel is treated. A hard decision on the erasure (i.e., the relay selecting a symbol at random in case of erasure occurrence) seriously degrades the performance of the overall system. Coding the erasure occurrences at the relay and transmitting this information via an extra bit to the ground station where it can be used by the decoder is suggested. Many examples with varying bit/photon energy efficiency and for the noisy and noiseless optical channel are considered. It is shown that coding the erasure occurrences dramatically improves the performance of the cascaded channel relative to the case of hard decision on the erasure by the relay. E.A.K.

N82-32543*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DSN DATA SYSTEMS SOFTWARE METHODOLOGY c61
C. K. Hung *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 132-143 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 09B

A software methodology for JPL deep space network (DSN) data systems software implementations through transfer and delivery is presented. The DSN Data Systems Software Methodology is compatible with and depends on DSN software methodology and also incorporates the characteristics of real-time program development in a DSN environment. The DSN Data Systems software implementation consists of a series of six distinct phases. An Independent Group is responsible for verification and validation of the DSN Data Systems software during developing phases. The DSN data systems software methodology is applied to all development software provided for or by the DSN data systems section in Mark IV where there is a desire for reliability, maintainability, and usability within budget and schedule constraints. E.A.K.

N82-32544*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A FEDERATED INFORMATION MANAGEMENT SYSTEM FOR THE DEEP SPACE NETWORK M.S. Thesis - Univ. of Southern California c82
E. Dobinson *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 144-152 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 05B

General requirements for an information management system for the deep space network (DSN) are examined. A concise review of available database management system technology is presented. It is recommended that a federation of logically decentralized databases be implemented for the Network Information Management System of the DSN. Overall characteristics of the federation are specified, as well as reasons for adopting this approach. E.A.K.

N82-32545*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONSCAN IMPLEMENTATION FOR ANTENNA CONTROL ASSEMBLY c37
J. E. Ohlson (Stanford Telecommunications, Inc.) and K. P. Abichandani *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 153-160 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 13I

The specifics of the CONSCAN, including calibration, signal cleanup, and system protection are presented. The CONSCAN was previously recommended for implementation in the antenna control assembly. Equations for programming the algorithms are provided. The described treatment is designed to lead to developing K-band. The recommended techniques to be employed in conjunction with CONSCAN are summarized: (1) for initial acquisition, employ stepped spiral search; (2) employ continued and incessant testing of signals to verify: in-lock, reasonable in level, and within limits; (3) use FFT for signal processing if feasible, as it provides more tests and insight into existence of glitches and spurious content of the input signal level. E.A.K.

N82-32546*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GCF MARK IV DEVELOPMENT c32
L. O. Mortensen *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 161-172 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 17B

The Mark IV ground communication facility (GCF) as it is implemented to support the network consolidation program is reviewed. Changes in the GCF are made in the area of increased capacity. Common carrier circuits are the medium for data transfer. The message multiplexing in the Mark IV era differs from the Mark III era, in that all multiplexing is done in a GCF computer under GCF software control, which is similar to the multiplexing currently done in the high speed data subsystem. E.A.K.

N82-32547*# Jet Propulsion Lab., California Inst. of Tech., Pasadena..
AN INTRODUCTION TO THE NEW PRODUCTIVITY INFORMATION MANAGEMENT SYSTEM (PIMS) c82
R. Hull *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 173-189 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 05B

The productivity information management system (PIMS), is described. The main objective of this computerized system is to enable management scientists to interactively explore data concerning DSN operations, maintenance and repairs, to develop and verify models for management planning. The PIMS will provide a powerful set of tools for iteratively manipulating data sets in a wide variety of ways. The initial version of PIMS will be a small scale pilot system. The following topics are discussed: (1) the motivation for developing PIMS; (2) various data sets which will be integrated by PIMS; (3) overall design of PIMS; and (4) how PIMS will be used. A survey of relevant databases concerning DSN operations at Goldstone is also included. E.A.K.

N82-32548*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TOP DOWN IMPLEMENTATION PLAN FOR SYSTEM PERFORMANCE TEST SOFTWARE c61
G. N. Jacobson and A. Spinak *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 190-199 (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 01B

The top down implementation plan used for the development of system performance test software during the Mark IV-A era is described. The plan is based upon the identification of the hierarchical relationship of the individual elements of the software design, the development of a sequence of functionally oriented demonstrable steps, the allocation of subroutines to the specific step where they are first required, and objective status reporting. The results are: determination of milestones, improved managerial visibility, better project control, and a successful software development. E.A.K.

N82-32549*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RATES OF SOLAR ANGLES FOR TWO-AXIS CONCENTRATORS c44
C. S. Yung and F. L. Lansing *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 200-211 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 10A

The Sun's position by the azimuth and elevation angles and

its rate of change at any time of day are determined to design 2 axis tracking mechanisms of solar concentrators. The Sun's angles and their rates for selected months of the year (March, June, September and December) and for seven selected atitudes (0, + or - 30, + or - 60, + or - 90) covering both the Northern and Southern Hemispheres were studied. The development of the angle and angle rate analytical expressions for any month, hour of day, and latitude provides the solar concentrator designer with a quantitative determination of the limiting Sun's position and angle rates for an accurate automatic tracking mechanism. E.A.K.

N82-32550# Applied Concepts Corp., Reston, Va.
A STUDY OF METRIC CONVERSION OF DISTILLED SPIRITS CONTAINERS: A POLICY AND PLANNING EVALUATION ON FINDINGS AND LESSONS LEARNED Final Report
James A. Simpson and Steve L. Barsby 28 Oct. 1981 45 p
(Contract AA-80-SAC-X8602)
(AD-A115644) Avail: NTIS HC A03/MF A01 CSCL 05/3

This report is the Task 4 report and final product for 'A Study of Metric Conversion of Distilled Spirits Containers: A Policy and Planning Evaluation,' performed by Applied Concepts Corporation for the United States Metric Board (USMB). This report summarizes the results for the entire project, which entailed: conducting a detailed case study of the distilled spirits conversion; developing and analyzing a set of hypothetical scenarios regarding the circumstances of the conversion and USMB's possible role in it; assessing the completeness and clarity of USMB's planning guidelines; conducting a survey of consumer awareness of and attitudes toward the conversion; and analyzing the implications of the findings from all the above for USMB policy. The report presents a brief overview of the major findings from the case study, regarding the actual events, issues, and impacts of the distilled spirits conversion. It traces the impacts of possible USMB intervention strategies under several alternative scenarios, in the context of the distilled spirits conversion. The study assesses the planning guidelines and analyzes the implications for USMB policy and presents a concise summary of findings and 'lessons learned' over the course of this project. Consumer survey results are attached in an Appendix. GRA

N82-32551# Applied Concepts Corp., Reston, Va.
SURVEY OF CONSUMER ATTITUDES AND AWARENESS OF THE METRIC CONVERSION OF DISTILLED SPIRITS CONTAINERS: A POLICY AND PLANNING EVALUATION
James A. Simpson and Steve L. Barsby 1 Dec. 1981 52 p
(Contract AA-80-SAC-X8602)
(AD-A116049) Avail: NTIS HC A04/MF A01 CSCL 13/4

The survey was conducted as part of a policy and planning evaluation study. The overall study was an examination of a completed private sector conversion to the metric system, in the light of the US Metric Board's planning guidelines and procedures. The conversion of distilled spirits containers took place prior to the establishment of the USMB. The study's objective was to use the completed version to determine if the guidelines and related procedures were adequate to help the conversion process. If they were not, the study was designed to provide suggestions for improvement. Author (GRA)

N82-32552# Educational Testing Service, Princeton, N. J.
DEVELOPING A COMMON METRIC IN ITEM RESPONSE THEORY
Martha L. Stocking and Frederic M. Lord Jun. 1982 43 p refs
(Contract N00014-80-C-0402; NR Proj. 150-453)
(AD-A116876; ETS-RR-82-25-ONR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A common problem arises when independent estimates of item parameters from two separate data sets must be expressed in the same metric. This problem is frequently confronted in studies of horizontal and vertical equating and in studies of item bias. This paper discusses a number of methods for transforming one metric to another metric and presents a new method. Data are given comparing this new method with a current method and recommendations are made. Author (GRA)

N82-32553# Centre Technique des Industries Mecaniques, Senlis (France).
ANALYSIS OF THE POSSIBILITIES AND LIMITS OF THE MOLDFLOW METHOD [ANALYSE DES POSSIBILITES ET LIMITES DE LA METHODE MOLDFLOW]
M. Brierre 4 Jan. 1982 119 p Partly in FRENCH and ENGLISH
(CETIM-12-B-252) Avail: NTIS HC A02/MF A01

The Moldflow information and computation service is presented. Moldflow is a computer program and data bank available as a computer aid to dimensioning thermoplastic injection molding equipment and processes. It is based on the simultaneous solution of thermal and rheological equations and is intended to completely simulate the injection process. The Moldflow system is described and algorithms are discussed, based on Moldflow listings. Author (ESA)

N82-32554# Centre Technique des Industries Mecaniques, Senlis (France).
INTEGRATED INSPECTION OF WORKPIECES FROM THE LARGE FORGE [PIECES DE GROSSE FORGE]
J. Rivenez Dec. 1981 11 p In FRENCH 2 Vol.
(CETIM-15-H-424-Vol-1) Avail: NTIS HC A02/MF A01

The feasibility of inspecting workpieces during fabrication while the part remains on a machine and simultaneous with machining operations was investigated. Techniques are outlined and studies are summarized. These include ultrasonic inspection of a turbine shaft, automated inspection integration, and an investigation on the integrated inspection of forged parts. Results indicate that wide variety in manufacturing criteria as well as great diversity in workpiece geometry render a universal solution extremely difficult to realize. Author (ESA)

N82-32555# Centre Technique des Industries Mecaniques, St. Etienne (France).
CONTACT PHENOMENA AND HEAT TRANSFER Final Report [PHENOMENES DE CONTACT ET TRANSFERTS THERMIQUES]
J. F. Renaudin Aug. 1981 33 p In FRENCH
(Contracts CETIM-5-75-5689; CETIM-5-78-1624)
(CETIM-1.3K-22-2) Copyright. Avail: NTIS HC A03/MF A01

A simplified method for the determination of the maximum surface temperature on a stamping die is presented. Deterioration of stamping dies was systematically studied. Results show that wear, especially due to abrasion, is highly dependent on instantaneous maximum surface temperature. A thermocouple was used in order to determine in situ temperature-time relations. The model evolved from these measurements leads to a mixed experimental/theoretical calculation method. Temperature spikes are calculated from tool in-service temperature measurements. The rise in temperature due to static contact is explained. The final temperature peak is then found by including friction heat effects. Author (ESA)

N82-32556# Centre Technique des Industries Mecaniques, St. Etienne (France).
PROSPECTIVE BONDING APPLICATIONS Final Report [ACTION PROSPECTIVE COLLAGE]
H. Ancenay and D. Benazet Jul. 1981 246 p refs In FRENCH
(CETIM-1.3N-27-2) Avail: NTIS HC A11/MF A01

Adhesive bonding in industry and in the laboratory is surveyed and prospects for its wider utilization are assessed. The economic impact of bonding technology on industry is discussed. Research is reviewed, centering on the development of nondestructive testing and inspection techniques. Traditional (wood) as well as new materials susceptible to bonding are considered. Applications in construction and civil engineering, in aeronautics, and in the automobile industry are covered. The use of glues in mechanical constructions, in assembling cylindrical parts, and in metal-metal bonding are examined. Hybrid assembling and bonding of composite materials are included. Author (ESA)

N82-32557# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Computer-Aided

Manufacturing.

TECHNICAL REVIEW OF THE ICAM PROGRAM, 25-27 JUNE 1980, PART 1

1981 75 p Sponsored in part by AFSC 2 Vol.
(Contract E49620-78-C-0027)
(PB82-163098) Avail: NTIS HC A04/MF A01 CSCL 13I

The Integrated Computer-Aided Manufacturing (ICAM) program of the U.S. Air Force Systems Command was evaluated. The Committee's assessment is that the ICAM program performs a valuable service to the United States in bringing together government, industry, and academia to further the development of computer-aided manufacturing modules and their integration. Contributions are being made in the areas of hardware and software, enabling technologies, individual CAM modules, and integration of modules. Comments on technology transfers, the level of effort of the ICAM program, and the balance of effort between projects in the ICAM program are discussed. In addition, it gives detailed reviews of key ICAM projects as of June 25-27, 1980. GRA

N82-32558# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Computer-Aided Manufacturing.

TECHNICAL REVIEW OF THE ICAM PROGRAM, FEBRUARY 1981, PART 2

1981 32 p Sponsored in part by AFSC 2 Vol.
(Contract E49620-78-C-0027)
(PB82-163080) Avail: NTIS HC A03/MF A01 CSCL 13I

A review of U.S. Air Force's Integrated Computer-Aided Manufacturing program is presented. Projects and technology transfer activities were assessed. Manufacturing architecture, fabrication, data bases, computer aided design, and materials handling and storage are among the topics considered. GRA

N82-32559# Purdue Univ., Lafayette, Ind. Joint Highway Research Project Office.

COMPRESSIBILITY OF FIELD COMPACTED CLAY Interim Report

Ping-Sien Lin and C. W. Lovell 13 Aug. 1981 173 p refs Sponsored in part by Indiana State Highway Commission
(Contract HPR-1-19)
(PB82-160326; JHRP-81-14; FHWA/IN/JHRP-81/14) Avail: NTIS HC A08/MF A01 CSCL 08M

The compressibility of a plastic Indiana clay (St. Croix) is studied for both field compaction. Conventional odometer tests were performed on a field compacted plastic clay to determine the effects of water content, dry density and compaction pressure on the as compacted and soaked compressibility behavior. As compacted samples were incrementally loaded; of particular interest was the value of compactive prestress induced during the compaction process. Environmental changes due to increased saturation were simulated using a back pressure technique. Of interest was the one dimensional percent volume change of wetting under load. Statistical analyses were performed to establish the best predictive models for prestress and one dimensional percent volume change on wetting, in terms of the important compaction variables. GRA

N82-32560# Mississippi State Highway Dept., Jackson. Forestry Sciences Lab.

END BEARING AND JOINT STRENGTHS OF COM-PLY JOISTS

Dick C. Wittenberg Jul. 1981 18 p refs Prepared in cooperation with HUD, Washington, D.C.
(PB82-175605; HUD-0002237) Avail: NTIS HC A02/MF A01 CSCL 13M

House framing with particleboard cores and veneer facings is evaluated. These COM-PLY composite materials were designed to be used interchangeably with conventional lumber and plywood in housing. The COM-PLY floor joists supported by four common methods were investigated: end bearing on wood plates, ledgers with end notching, end bearing on metal joist hangers, and nails only. End bearing and joint strength of COM-PLY joists proved satisfactory for all four common methods of support. Tabular data and illustrative photographs and drawings are provided. GRA

N82-32561# Mississippi State Highway Dept., Jackson. Research and Development Div.

EXPERIMENTAL USE OF EVAZOTE JOINT MATERIALS Interim Report

James O. Coley Sep. 1981 39 p
(PB82-170465; FHWA/RD-81/S01172; MSHD-RD-81-067-3; IR-1) Avail: NTIS HC A03/MF A01 CSCL 13B

The performance of Evazote joint material is discussed. Merits and shortcomings noted in evaluations are listed. This material is designed to be used in expansion joints in roadways, bridges, sidewalks, roofs and walls, as well as other areas requiring a waterproof filler. Evazote material has been placed in joints on one bridge and in a number of highly expansive joints in prestressed concrete pavement. GRA

N82-32562# Cincinnati Univ., Ohio. Dept. of Civil and Environmental Engineering.

DETERMINATION OF IMPORTANCE OF VARIOUS PARAMETERS ON PERFORMANCE OF RIGID PAVEMENT JOINTS Final Report

John P. Cook, Issam Minkarah, and J. F. McDonough Aug. 1981 178 p refs Prepared in cooperation with the Federal Highway Administration
(PB82-169491; FHWA/OH-81/006) Avail: NTIS HC A09/MF A01 CSCL 13B

The effects of various parameters on an experimental concrete pavement were evaluated. Variables included in the pavement were (1) joint spacing, (2) subbase stabilization, (3) coating of dowel bars, (4) configuration of the saw cut, and (5) the use of skewed joints. Both long term and short term horizontal movements caused by temperature and vertical movement of slab ends under known axle loads were measured. A record of cracking and spalling of the pavement is also included. A statistical analysis of both long and short term movements was conducted and recommendations for joint design are included. GRA

N82-32563# National Science Foundation, Washington, D. C. Environment, Energy and Resources Group.

FEDERAL ROLE IN THE COMMERCIALIZATION OF ACTIVE SOLAR HEATING AND COOLING TECHNOLOGY: PAPERS FOR AND A SUMMARY OF A WORKSHOP

1981 225 p refs Workshop held in Washington, D.C., 18-19 Sep. 1980
(PB82-173402; NSF/PRA-81021) Avail: NTIS HC A10/MF A01 CSCL 13A

Active solar heating and cooling technology and prospects for commercial applications is assessed. Decision factors affecting commercialization emphasize land use controls and solar access issues; barriers and conditions which appear to retard commercial viability and social technology; government intervention to accelerate implementation; criteria to allocate resources among alternate incentive programs; analysis of solar incentives; and frustrations, concerns, and insights of a pioneer in solar technology. GRA

N82-32564# Massachusetts Univ., Amherst.

WORKSHOP ON ASSEMBLY AND INSPECTION Final Report

G. Boothroyd, ed. Sep. 1981 91 p refs Workshop held at Amherst, Mass., 8-9 Jun. 1981
(Grant NSF MEA-81-15036)
(PB82-172586; NSF/MEA-81014) Avail: NTIS HC A05/MF A01 CSCL 13H

Assembly and inspection in industrial manufacturing is discussed. Individuals involved in industrial manufacturing expressed their views on such questions as: What kind of research is most likely to lead to significant improvements in manufacturing productivity. What lessons can be learned from the research conducted in other countries. What are the social and economic impacts of actual and proposed research and what educational benefits can be obtained. A list of attendees is provided and eight formal presentations are summarized. Final recommendations stressed

the need for integration of design and manufacturing functions in industry research to improve flexibility of assembly automation and use of the systems approach to productivity improvements in assembly and inspection. GRA

N82-32565# National Bureau of Standards, Washington, D.C.
PROCEEDINGS OF THE 66TH NATIONAL CONFERENCE ON WEIGHTS AND MEASURES, 1981
Harold F. Wollin, Louis E. Barbrow, and Ann P. Heffernan Dec. 1981 279 p Proceedings held at St. Louis, Mo., 13-17 Jul. 1981
(PB82-278997; NBS-SP-629; LC-26-27766) Avail: NTIS HC A13/MF A01 CSCL 14B

Major issues discussed included measurement science education, enforcement uniformly, national type approval, inch pound and metric labeling provisions, new design and performance requirements for weighing and measuring technology, metric conversion of retail gasoline dispensers, weights and measures program evaluation studies of model State laws and regulations and their adoption by citation or other means by State and local jurisdictions, and report of States conducting grain moisture meter testing programs. GRA

N82-32566# Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
A PAVEMENT MOISTURE ACCELERATED DISTRESS (MAD) IDENTIFICATION SYSTEM, VOLUME 1 Final Report, 1 Oct. 1977 - 31 Mar. 1980
Samuel H. Carpenter, Michael I. Darter, Barry J. Dempsey, and Stan Herrin Washington Federal Highway Administration Sep. 1981 147 p refs
(Contract DOT-FH-11-9175)
(PB82-181728; FHWA/RD-81/079-Vol-1; SSD-2-80-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 13B

The development of extrinsic (climate) and intrinsic (material property) factors that impact on the moisture related performance of a pavement are presented. Procedures are presented which allow the engineer to classify a pavement as to the potential for moisture accelerated damage (MAD) to occur. This analysis can be performed in the office during initial planning stages to indicate areas where moisture damage may be expected. The areas noted with a high potential for MAD can be investigated further by visual NDT, or coring operations during the normal development of the rehabilitation project. This simplified analysis allows the engineer to see where, and why moisture damage should develop, and aids him in evaluating drainage problems of particular materials and considering the need for further drainage studies. GRA

N82-32567# Illinois Univ., Urbana-Champaign. Dept. of Civil Engineering.
A PAVEMENT MOISTURE ACCELERATED DISTRESS (MAD) IDENTIFICATION SYSTEM, VOLUME 2 Final Report, 1 Oct. 1977 - 31 Mar. 1980
Samuel H. Carpenter, Michael I. Darter, and Barry J. Dempsey Washington Federal Highway Administration Sep. 1981 242 p
(Contract DOT-FH-11-9175)
(PB82-181736; FHWA/RD-81/080-Vol-2; SSD-5-80-Vol-2) Avail: NTIS HC A11/MF A01 CSCL 13B

A users manual is designed which provides the engineer with a rational method of examining a pavement and determining rehabilitation needs that are related to the causes of the existing distress, particularly moisture related distress. The key elements in this procedure are the MAD Index developed in Volume 1, the Pavement Condition Index (PCI) and the Moisture Distress Index (MDI). Step by step procedures are presented for calculating each parameter. Complete distress identification manuals are included for asphalt surfaced highways and jointed reinforced concrete highways with pictures and descriptions of all major distress types. Descriptions of the role moisture plays in the development of each distress type are included. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N82-32568*# GTE Labs., Inc., Waltham, Mass.
DIVERSITY RECEPTION OF COMSTAR SHF BEACONS WITH THE TAMPA TRIAD, 1978 - 1981 Final Report
D. Davidson and D. D. Tang 1 Jan. 1982 60 p refs Prepared for JPL
(Contracts NAS7-100; JPL-956078)
(NASA-CR-169297; NAS 1.26:169297) Avail: NTIS HC A04/MF A01 CSCL 20N

The results of 19 GHz downlink rain attenuation diversity measurements in Tampa over a 29 month period (1978-1980), and the results of a 20 GHz diversity study during the summer of 1981, using the remaining COMSTAR beacon are presented. At 19 GHz, site separations of 11, 16, and 20 km were used, with reception at high elevation angle (about 57 deg). At 29 GHz, only the 16 km baseline was employed, with elevation angle about 32 deg. Almost identical long term performance of the two longer baselines indicates that for separations above about 15 km diversity improvement was not sensitive to baseline length or direction. Diversity improvement at 29 GHz with the 16 km baseline was similar to that predicted by scaling the 19 GHz results of the previous seasons. Also discussed are the type of attenuation distributions and typical fade durations to be found under persistent convective conditions. For rain climates like Tampa's, site diversity in some form will be required for high reliability SHF satellite links. The diversity data may be helpful in designing schemes for resource sharing among numbers of links. J.M.S.

N82-32569*# Research Triangle Inst., Research Triangle Park, N. C.
DEVELOPMENT OF A SPEECH AUTOCUER Quarterly Report, 1 Oct. - 31 Dec. 1980
Robert L. Bedles, Paul N. Kizakvich, Dewey T. Lawson, and Michael L. McCartney 31 Dec. 1980 17 p
(Contract NAS5-25832)
(NASA-CR-170438; NAS 1.26:170438; RTI/1878/00-05Q; QPR-5) Avail: NTIS HC A02/MF A01 CSCL 17B

A wearable, visually based prosthesis for the deaf based upon the proven method for removing lipreading ambiguity known as cued speech was fabricated and tested. Both software and hardware developments are described, including a microcomputer, display, and speech preprocessor. S.L.

N82-32570# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
OUTER BOUNDS ON THE CAPACITY OF INTERFERENCE CHANNELS
Aydano B. Carleial May 1982 25 p refs Presented at the 1982 IEEE Intern. Symp. for Inform. Theory, Les Arcs, France, 21-25 Jun. 1982 Submitted for publication
(INPE-2414PRE/122) Avail: NTIS HC A02/MF A01

Outer bounds are demonstrated for the capacity regions of discrete memoryless interference channels and Gaussian interference channels. The bound for discrete channels coincides with the capacity region in special cases. The bound for Gaussian channels improves previous knowledge when the interference is of medium strength. Author

N82-32571# Institute for Telecommunication Sciences, Boulder, Colo.
NONDIRECTIONAL BEACONS: COVERAGE LIMITATIONS DUE TO NIGHT EFFECT Final Report
L. A. Berry and M. E. Johnson Jul. 1982 26 p refs
(FAA-RD-82-44) Avail: NTIS HC A03/MF A01 CSCL 20N

The distances at which the ground wave component of the field of a nondirectional beacon is 10dB stronger than the sky

wave component for 90 percent of the time were computed using CCIR propagation prediction techniques. The distances are presented for frequencies from 190 kHz to 1000 kHz and for ground conductivities from 0.00025 mho/m to mho/m. S.L.

N82-32572# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE RECOGNITION OF WORDS FROM PHONEMES IN CONTINUOUS SPEECH M.S. Thesis
Claude A. Baker Dec. 1981 98 p refs
(AD-A115615; AFIT/GE/EE/81D-9) Avail: NTIS HC A05/MF A01 CSCL 17/2

Continuous speech recognition for a vocabulary of the digits 0 through 9 is discussed. Recognition is accomplished by parsing phoneme strings obtained from an acoustic analyzer. Word recognition is accomplished by a finite state automata implemented in PASCAL. Novel features of the program include the ability to load and exercise state tables representing different vocabularies, as well as the ability to interactively edit and modify the state tables without recompiling. Complete details of the program are included. The quality of recognition is indeterminate at this time. Sufficient training of the system was not accomplished to determine validity of the recognition strategy. The system will parse all utterances for which it was trained, although no more than four utterances of each word were incorporated in the state tables. R.J.F.

N82-32573# Ohio State Univ., Columbus. Electroscience Lab.
GEODESIC PATHS OF AN ELLIPSOID-MOUNTED ANTENNA
Jeung G. Kim, Nan Wang, and C. D. Chuang Mar. 1982 100 p refs
(Contract N00019-81-C-0424)
(AD-A116453; ESL-714215-1) Avail: NTIS HC A05/MF A01 CSCL 09/1

In applying the high frequency ray technique (GTD) to the radiation problems of an Ellipsoid-mounted antenna, it is essential to determine the geodesic paths on the surface. An efficient, approximate solution for the geodesic paths on the ellipsoid surface, which in turn can be used to model an aircraft or missile fuselage is studied here. Another elaborate method for the geodesic paths employing the calculus of variations is also presented to show the validity of the approximation solution. Typical ellipsoid geometries were chosen and tested for various antenna locations on those surfaces. Good agreement between both methods within the significant energy region confirms that the geodesic paths are efficiently solved via this numerical approach. Author (GRA)

N82-32574# Illinois Univ., Chicago. Communications Lab.
BASIC CONCEPTS OF RADAR POLARIMETRY AND ITS APPLICATIONS TO TARGET DISCRIMINATION, CLASSIFICATION, IMAGING AND IDENTIFICATION
Wolfgang-Martin Boerner 18 May 1982 69 p refs
(Contract N00019-80-C-0620)
(AD-A116391; EMID-CL-82-05-18-02) Avail: NTIS HC A04/MF A01 CSCL 17/9

In meticulous detail, a succinct summary of basic electromagnetic wave polarization descriptors, of the various scatterer polarization transformation matrices, and its invariants of the associated optimal matrix polarizations, and of the scatterer descriptive operators is introduced. It is then shown how the five (5) independent matrix parameter for the relative phase mono-static scattering matrix describing an isolated, yet regionally distributed, target in a reciprocal propagation medium can be recovered from (1) amplitude-only, (2) mixed amplitude plus partial phase, (3) complete two-step amplitude-phase measurements. Basic properties of the radar scattering matrix for linear (H, V) and circular (R, L) polarization basis are described in terms of geometrical target features as functions of the specular point surface coordinate parameters, known as Gaussian principal, main and related curvature functions. Based upon this succinct background introduction on radar polarimetry, the concepts are applied mainly for the coherent case to various classes of increasing order of sophistication, as defined in detail in the INTRODUCTION, to the problem of radar target handling for the non-cooperative, limited-data case. Author (GRA)

N82-32575# Illinois Univ., Chicago. Communications Lab.
A REVISITATION OF THE PHENOMENOLOGICAL APPROACH WITH APPLICATIONS TO RADAR TARGET DECOMPOSITION
J. Richard Huynen 18 May 1982 55 p refs
(Contract N00019-80-C-0620)
(AD-A116390; UICC-EMID-CL-82-05-18-01) Avail: NTIS HC A04/MF A01 CSCL 17/9

This report highlights some results of a phenomenological approach to radar targets, with applications. The approach grew out of the common sense realization that only those target data are acceptable for discrimination and identification purposes which can be shown to relate in a physically meaningful way to basic target structure. Only then can data, often gathered at great expense, obtained for one type of system, be expected to be useful productively for a new system and hence improve efficiency and cost factors. Although these comments are almost self-evident and common sensical in nature, examples are given to show how this systematic approach has an important effect on the mathematical and practical development toward target identification (inverse) problems. The effect of antenna and target orientation angle on corrupting target information is stressed, in contrast to common practice to allow single H or V polarization data to be accepted as meaningful. The report summarizes the general target decomposition theorems, proved by the author in 1970. It shows that a single-coherent object is electromagnetically irreducible (it cannot be broken down mathematically as the incoherent sum of the smaller parts without violating physical principles). All this opens up new vistas for optimal signal processing schemes which extend the present predominantly scalar case to include vector scattering problems. It is hoped that by these efforts improved reliability with reduced costs for target discrimination and identification purposes can be achieved. Author (GRA)

N82-32576# Pirelli Cable Corp., Union, N.J.
RF ABSORPTION BY SUBMICRON METALLIC PARTICLES Final Report, 1 Sep. 1980 - 31 Aug. 1981
William A. Janos 31 Aug. 1981 127 p refs
(Contract N00014-80-C-0926; RR0210101)
(AD-A116473; J001) Avail: NTIS HC A07/MF A01 CSCL 17/9

A comprehensive treatment is presented of the individual and collective RF absorbing properties of small, dilutely distributed metallic particles, under the conditions that the particles be Rayleigh scatterers having at least one submicron dimension. The particles are assumed spheroidal in shape of solid metal, and metal-layered with a non conducting, RF transparent core. The internal electric field and hence the electric moment of an RF irradiated particle is derived from the perturbation solution to the Green's theorem integral equation depicting the depolarizing effect of the induced surface charged and the power dissipation due to the volume current. The resultant internal field is thus the depolarized incident field within a skin-depth attenuation distance from the particle surface. The depolarizing factor derives naturally from the integral formulation, as the internal solid angle subtended by the surface normal component of the incident electric field. The efficiency of absorbers is then characterized by their depolarizing factors, conductivities, and A.C. permeabilities for ferromagnetic materials. GRA

N82-32577# Army Communications-Electronics Command, Fort Monmouth, N.J. Center for Communications Systems.
ECCM PERFORMANCE OF THE DIGITAL MICROWAVE RADIO UNDER ADVERSE WEATHER CONDITIONS
James E. Bartow May 1982 31 p refs
(AD-A115706; CECOM-82-2) Avail: NTIS HC A03/MF A01 CSCL 17/4

The Digital Microwave Radio will operate at 15 GHz and will provide multichannel ECCM radio communications. Rain attenuation causes severe signal reduction in this band. The communication reliability, considering multipath and rain attenuation, is determined

for radio relay network and the improvement in reliability by use of alternate routing is estimated. Author (GRA)

N82-32578# Army Communications-Electronics Command, Fort Monmouth, N.J. Center for Communications Systems.
ELECTROMAGNETIC COUNTER-COUNTER MEASURE (ECCM TECHNIQUES OF THE DIGITAL MICROWAVE RADIO
James E. Bartow May 1982 32 p refs
(AD-A115705; CECOM-82-3) Avail: NTIS HC A03/MF A01 CSCL 17/4

The Digital Microwave Radio will provide an ECCM capability in a new multichannel radio for tactical and strategic LOS radio relay applications. It will incorporate a null/beam steering antenna, direct sequence and frequency hopping spread spectrum techniques and forward error correction coding. In addition it will feature adaptive bit rate control and power output control. A modular approach will enable all various combinations of techniques to be used in a number of applications. Author (GRA)

N82-32579# Dayton Univ., Ohio.
EVALUATION OF REINFORCED PLASTIC RADOME MATERIALS Interim Technical Report, Aug. 1980 - Jun. 1981
James C. McKiernan and D. Robert Askins Wright-Patterson AFB, Ohio AFWAL Nov. 1981 48 p
(Contract F33615-80-C-5011; AF Proj. 2421)
(AD-A115794; UDR-TR-81-75; AFWAL-TR-81-4129) Avail: NTIS HC A03/MF A01 CSCL 17/9

A program was conducted to measure mechanical, physical, and thermophysical properties of fiber reinforced composite radome materials in support of the Joint Army, Navy, Air Force (JANNAF) laser study. Over half of the materials were found to contain voids distributed through their interiors. One was found to contain numerous microcracks. No conclusions are drawn since the objective of the effort was simply to obtain and report the data. Author

N82-32580# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MODELING OF A TRACKING RADAR IN TERMS OF A NONLINEAR SECOND ORDER PHASE LOCK LOOP M.S. Thesis
Peter M. Cronk Dec. 1981 120 p refs
(AD-A115628; AFIT/GE/EE/81D-14) Avail: NTIS HC A06/MF A01 CSCL 17/9

An Amplitude Comparison Monopulse radar is modeled using additive channel and system noise to the received signals. The amplitude of the incoming signal and the angle off boresight are estimated under the Maximum Likelihood Criteria. An ensemble of estimates of the angle off boresight are used to derive probability density functions for the estimate angle off boresight. From these probability density functions, a criteria for predicting break lock is derived. Author (GRA)

N82-32581# Mission Research Corp., Santa Barbara, Calif.
HF GROUND WAVE PROPAGATION OVER SMOOTH AND IRREGULAR TERRAIN Final Report, 1 Jan. 1980 - 30 Apr. 1981
Gordon J. Fulks 30 Apr. 1981 66 p refs
(Contract DNA001-80-C-0022; DNA Proj. Q94-QAXH)
(AD-A115747; MRC-R-621; DNA-5796F) Avail: NTIS HC A04/MF A01 CSCL 20/14

This report addresses several aspects of ground wave propagation. Included are discussions of the general characteristics of ground waves as well as specific formulas for predicting ground wave field strengths at arbitrary locations from a standard transmitter. These formulas, from the work of Bremmer, apply to either vertical or horizontal polarization, to a smooth spherical earth, and to a wide variety of soil types. A computer program to evaluate the formulas is presented and sample results are given. Although this report concentrates on HF frequencies, many of the results are applicable to a much wider range of frequencies. Atmospheric refraction, which may enhance ground wave propagation, is discussed. Formulas for predicting refraction effects based on atmospheric temperature and humidity as well as temperature and humidity gradients are presented. Propagation over inhomogeneous and irregular terrain is considered. Only limited aspects of such propagation are discussed with an emphasis on irregular terrain. Obstacle gain is covered in some detail. Because of the lack of experimental data for ground wave propagation over irregular terrain at HF frequencies, an experiment is recommended. Author (GRA)

N82-32582# Pacific-Sierra Research Corp., Santa Monica, Calif.
TRANSVERSE ELECTRIC WAVES FOR VLF/LF COMMUNICATION BETWEEN AIRCRAFT Final Technical Report, Apr. 1980 - Oct. 1981
E. C. Field, Jr. Nov. 1981 53 p refs Presented at the NATO-AGARD Electromag. Wave Propagation Panel, Brussels, 21-25 Sep. 1981
(Contract N00014-80-C-0398; NR Proj. 089-156)
(AD-A115834; PSR-1125) Avail: NTIS HC A04/MF A01 CSCL 17/2

This report compares the excitation and propagation of VLF/LF transverse electric (TE) and transverse magnetic (TM) long waves in the earth-ionosphere waveguide. It calculates the dependence of TE and TM mode parameters on three factors: (1) ground conductivity, (2) state of the ionosphere, and (3) elevation of terminals above the ground. It also briefly addresses the effects of atmospheric noise and ground-based jammers on the performance of TE links. Results are given for frequencies between 20 and 50 kHz. Only TM signals are efficiently radiated by ground-based transmitters. However, TE signals are strongly excited by nearly horizontal trailing-wire antennas at elevations exceeding 20 kft and, thus, can be important for air-to-air links. Poorly conducting ground heavily degrades TM propagation, but it will not affect TE propagation if the terminals are elevated at least 5000 ft. TE signals are, therefore, better suited than TM signals for air-to-air links that traverse Greenland and much of Canada. For paths over highly conducting ground, TM signals suffer less degradation than TE signals during intense disturbances; for ground conductivities less than about .0001 mhos/m, however, TM signals are more adversely affected. TE signals also provide protection against ground-based jammers under disturbed ionospheric conditions where geomagnetic conversion is slight. Author (GRA)

N82-32583# Princeton Univ., N. J. Dept. of Electrical Engineering and Computer Science.
DIGITAL SIGNAL PROCESSING Final Report, 1 Feb. 1979 - 31 Mar. 1982
J. B. Thomas and K. Steiglitz 7 Jun. 1982 14 p refs
(Contract DAAG29-79-C-0024)
(AD-A115819; ARO-16011.28-EL) Avail: NTIS HC A02/MF A01 CSCL 09/2

Virtually all of the important research results obtained were reported in journal articles and conference papers. Brief summaries of the major contributions are given. The summaries relate to: Digital Filter Design; Theory of the DFT; New Algorithms; Communication Networks; VLSI Architectures for Signal Processing; Adaptive and Nearly Optimal Detectors; Robust Detection; Structure of Random Processes; Quantization; and Sequential Detection. GRA

N82-32584# Illinois Univ., Chicago. Electromagnetic Imaging Div.
A HIGH FREQUENCY INVERSE SCATTERING MODEL TO RECOVER THE SPECULAR POINT CURVATURE FROM POLARIMETRIC SCATTERING DATA M.S. Thesis
Bing-Yuen Foo 21 May 1982 162 p refs
(Contracts N00014-80-C-0708; N00014-80-C-0773; DAAG29-80-K-0027)
(AD-A115805; EMID-CL-1982-05-21-01) Avail: NTIS HC A08/MF A01 CSCL 20/14

Based on the time-domain first order correction to the physical optics current approximation, a relationship between the phase factors of the polarimetric scattering matrix elements and the principal curvatures at the specular point of a scatterer is

established. The above phase-curvature relationship is tested by applying it to theoretical as well as experimental backscattering data obtained for a prolate spheroidal scatterer. The results of these tests not only determine the acceptability of the phase-curvature relationship, they also point out the range of kb values over which the first order correction to the physical optics currents is valid, and which serves as a compromise range between the high frequency condition required by the curvature recovery model and the drawback to lower frequencies required to prevent critical magnification of measurement errors. Another curvature recovery equation is derived by transforming the linear polarization basis to the circular polarization basis. The curvature recovery model is proven to satisfy the image reconstruction identities of invariant transformation. A scattering ratio is defined and its behavior is investigated at high frequencies. Its plot on the complex plane provides a simple way to help judge the accuracy of polarimetric scattering measurement, regardless of whether a linear or a circular polarization basis is used. GRA

N82-32585# Lincoln Lab., Mass. Inst. of Tech., Lexington.
VHF PROPAGATION OF OVER HILLY, FORESTED TERRAIN
M. Littleton Meeks 9 Apr. 1982 69 p refs
(Contract F19628-80-C-0002; ARPA Order 3724; AF Proj. 2E20)
(AD-A115746; CMT-19; ESD-TR-82-037) Avail: NTIS HC A04/MF A01 CSCL 20/14

We have made propagation measurements at low altitudes over hilly, forested terrain with the objective of developing a computer-based propagation model capable of predicting path loss given the terrain profile between transmitter and receiver. The measurements were made at a frequency of 110.6 MHz with the VOR station at Gardner, Massachusetts, as a transmitter. The received signal was measured at distances between 7 and 15 km by making vertical descents with a helicopter from altitudes of roughly 800 m down to 10 m above ground. We found good agreement between the measurements and model predictions based on an extension of the Deygout approximation. Use of two knife-edges was sufficient to characterize the terrain diffraction. Negligible multipath reflection was observed from this terrain.
Author (GRA)

N82-32586# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
RESEARCH ON FERROELECTRIC MATERIALS FOR MILLIMETER WAVE APPLICATION Semiannual Technical Report, 5 Aug. 1981 - 28 Feb. 1982
R. R. Neurgaonkar, I. E. Cross, W. F. Hall, and W. W. Ho May 1982 38 p refs
(Contract F49620-81-C-0090; ARPA Order 4240; AF Proj. 2306)
(AD-A115868; MRDC41097.3TR; AFOSR-82-0509TR; SATR-1)
Avail: NTIS HC A03/MF A01 CSCL 20/14

A one-year research program has been undertaken to determine whether certain selected ferroelectric materials can be used to obtain effective phase control in millimeter wave radar systems. This investigation is an outgrowth of earlier work at Rockwell which included the first demonstration of microwave phase modulation in strontium barium niobate (SBN) single crystals. The present study combines materials development and millimeter wave characterization to investigate the feasibility of achieving sensitivity of the microwave refractive index to an applied electric field, dn/dE, in excess of 1/10,000 meters/volt, while maintaining absorptive loss in the material below a few dB per millimeter. Because measurements early in the program revealed high absorptive losses in the available strontium barium niobate crystals, the first six months have been devoted to expanding the materials base. In addition to the development of growth techniques for other tungsten bronze ferro-electrics, measurements of millimeter wave dielectric properties have been carried out on these ferroelectric and other systems obtained from the Penn State Materials Research Laboratory, including an antiferroelectric ceramic lead-lantanum zirconate-titanate (PLZT). These measurements generally show large decreases in polar axis permittivity from their dc values, suggesting an extrinsic origin for the bulk of the dc permittivity. The material factors controlling this phenomenon should be explored, since they will determine to what extent the observed high losses can be reduced over the frequency range of interest. Author (GRA)

N82-32587# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
HIGH TEMPERATURE MILLIMETER WAVE CHARACTERIZATION OF THE DIELECTRIC PROPERTIES OF ADVANCED WINDOW MATERIALS Final Report, 1 Sep. 1979 - 21 Jan. 1982
W. W. Ho Watertown, Mass. Army Materials and Mechanics Research Center May 1982 60 p refs
(Contract DAAG46-79-C-0077)
(AD-A115851; SC5235.18FR; AMMRC-TR-82-28) Avail: NTIS HC A04/MF A01 CSCL 20/14

Experimental methods have been developed to determine the dielectric properties of candidate radome materials at 35 and 94 GHz for temperatures up to 1700 C. Measurements have been carried out on fuzed silica, single crystal sapphire, hot-pressed silicon nitride, beryllium oxide and boron nitride as a function of temperature, composition and manufacturing procedures. Dielectric characterization data are presented in tabular and graphic forms to provide the necessary data base for evaluation of millimeter wave transmission properties of these materials in radome applications. Author (GRA)

N82-32588# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
ELECTROMAGNETIC TRANSMISSION THROUGH AN APERTURE OF ARBITRARY SHAPE IN A CONDUCTING SCREEN
Chih-Lin I and Roger F. Harrington Apr. 1982 98 p
(Contract N00014-76-C-0225)
(AD-A115593; TR-82-5; TR-16) Avail: NTIS HC A05/MF A01 CSCL 20/14

In this work the problem of electromagnetic transmission through an arbitrarily-shaped aperture (undercovered) or window (covered with a thin glossy dielectric sheet) in a perfectly conducting plane is treated. The method of moments is used to solve numerically the integral equation for the equivalent magnetic current. Triangular patching is used to conform to the arbitrary shape. Local position vectors are chosen as both the expansion functions and the testing functions. The centroid-pair matching is utilized to complete the approximation. A set of computer codes is presented and briefly described. To illustrate the solutions, computations are given for various apertures (different shapes), windows (different dielectric materials), and half spaces (different media). Numerical results are also compared with other data, if available. For windows with proper thickness or half spaces with proper media, the phenomenon of aperture resonance is demonstrated. Author (GRA)

N82-32589# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
SATNET DEVELOPMENT AND OPERATION, PLURIBUS SATELLITE IMP DEVELOPMENT, REMOTE SITE MAINTENANCE, INTERNET OPERATIONS AND MAINTENANCE, MOBILE ACCESS TERMINAL NETWORK, TCP FOR THE HP3000, TCP FOR VAX-UNIX Quarterly Technical Report, 1 Feb. - 30 Apr. 1982
J. F. Haverty May 1982 76 p
(Contracts N00039-82-C-0412; MDA903-80-C-0353;
MDA903-80-C-0214; N00039-80-C-0664; N00039-81-C-0408;
DAHC15-69-C-0179; F08606-73-C-0027; F08606-75-C-0032;
MDA903-76-C-0214; MDA903-76-C-0252)
(AD-A115773; BBN-5003; QTR-25) Avail: NTIS HC A05/MF A01 CSCL 17/2

This Quarterly Technical Report describes work on the development of and experimentation with packet broadcast by satellite; on development of Pluribus Satellite IMPs; on a study of the technology of Remote Site Maintenance; on Internetwork monitoring; on shipboard satellite communications; and on the development of Transmission Control Protocols for the HP3000 and VAX-UNIX. Author (GRA)

N82-32590# Naval Postgraduate School, Monterey, Calif.
DYNAMIC MULTICOMMODITY FLOW SCHEDULES Ph.D. Thesis
Adam Feit Dec. 1981 258 p refs
(ARPA Order 3924)
(AD-A115002; NPS62-81-039) Avail: NTIS HC A12/MF A01 CSCL 17/2

Some new results in the scheduling of dynamic multicommodity flows in data communication networks are presented. A new performance measure for effective delivery of backlogged data to their destinations is defined and the solution to the resulting delivery problem is obtained through a sequential linear optimization methodology. Properties of an optimal dynamic multicommodity flow schedule are studied in detail, taking advantage where possible of the linear programming formulation. The special case of the delivery problem in a single destination network also is analyzed. Application of the results to stochastic delivery problems in which the data inputs to the network are modelled as Poisson processes is addressed, and a new dynamic data communication network analysis is presented. Finally, the delivery problem on networks with capacitated links and with traversal delays is considered and some new results obtained. Author

N82-32591# Fernmeldetechnisches Zentralamt, Darmstadt (West Germany). Forschungsinst.
JITTER AND ERROR INSERTION IN A DIGITAL SIGNAL [JITTER- UND FEHLEREINBLENDUNG IN EIN DIGITALES SIGNAL]
Dieter Becker Dec. 1981 30 p refs In GERMAN; ENGLISH summary
(FTZ-442-TBr-68) Avail: NTIS HC A03/MF A01

Standards based on CCITT recommendations, are given for the maximum permissible jitter and error rate at the inputs to digital transmission systems for the three hierarchy levels at 2.048 Mbit/sec, 8.448 Mbit/sec, and 34.368 Mbit/sec. Existing equipment for error measurement, jitter measurement and the generation of jitter is described. The causes of jitter and bit errors are investigated. Methods for the addition of any amount of jitter to the amplitude and frequency of a digital signal and for the insertion of an adjustable number of errors in a binary signal are indicated. A measurement unit is shown which can be equipped with exchangeable components for the transmission rate of the intended application and for the insertion of jitter or errors. Error insertion effects on digital transmission equipment are discussed after determination of maximum permissable amount of jitter.
Author (ESA)

N82-32592# European Space Agency, Paris (France).
PROPOSAL FOR AN EARTH STATION ANTENNA FOR GEO-STATIONARY SATELLITES WITH A SIMPLE CONCEPT OF BEAM STEERING
Peter Sliwinski and Hans-Juergen Steiner Apr. 1982 68 p refs Transl. into ENGLISH of "Vorschlag einer Bodenstationsantenne fuer geostationaere Satelliten mit dem Konzept einer einfachen Strahlnachfuehrung" Rept. DFVLR-Mitt-81-05 DFVLR, Oberpfaffenhofen, West Ger., Nov. 1980 67 p
(ESA-TT-717; DFVLR-Mitt-81-05) Avail: NTIS HC A04/MF A01; original German version available from DFVLR, Cologne DM 14,40

A center feed Cassegrain system with a conical corrugated horn and doubly curved reflector is proposed. The beam shaping has the purposes: reduction of interference with neighboring satellites and beam steering in one direction, e.g. azimuth direction. The beam steering is realized by lateral displacement of the subreflector. The effects of feed displacement are investigated by analytical methods. The radiation characteristics, such as gain and side lobes, are described in detail. A design example of a ground station antenna is given. The radiation patterns at 11 GHz for focused and defocused antenna systems are calculated. Results show 50.5 dBi, half power beam width 0.30 deg and 0.92 deg; in this angle range the cross polarization is greater than 40 dB.
Author (ESA)

N82-32593# European Space Agency, Paris (France).
ON THE ACCURACY OF RADIOLOCATION IN MEDIA WITH INDIRECT WAVE PROPAGATION
Emil Sappl Mar. 1982 29 p refs Transl. into ENGLISH of "Ueber die Genauigkeit von Funkortung bei Wellenausbreitung auf Umwegen" Rept. DFVLR-FB-81-02 DFVLR, Oberpfaffenhofen, West Germany, Dec. 1980 32 p
(ESA-TT-729; DFVLR-FB-81-02) Avail: NTIS HC A03/MF A01; original German version available from DFVLR, Cologne DM 8,10

How far the errors of position determination systems, based on radio frequency range measurements and operating in urban areas, can be eliminated by appropriate evaluation of the measurements is considered. The lower limit for the final position error is found, based on the statistical properties of the errors, which no evaluation method can improve on. This limit is calculated for a system with four reference points at the corners of a square.
Author (ESA)

N82-32594# European Space Agency, Paris (France).
VISUAL EVALUATION OF SIDE-LOOKING AIRBORNE RADAR (SLAR) IMAGERY
Juergen Nithack May 1982 63 p refs Transl. into ENGLISH of "Visuelle Auswertung von E-SLAR-Aufnahmen" Rept. DFVLR-FB-81-11 DFVLR, Oberpfaffenhofen, West Ger., Feb. 1981 51 p
(ESA-TT-734; DFVLR-FB-81-11) Avail: NTIS HC A04/MF A01; original German version available from DFVLR, Cologne DM 13,10

The use of aerial photography data analysis techniques with geoscientific SLAR data, recorded on video tape during aircraft flights, was investigated. Good geomorphological information can be obtained if the variations in the rock and soil are morphologically displayed. Data can be interpreted morphologically even where there are height differences of + or - 200m (in relation to a mean level). The flight paths should run parallel to the principal morphological structures. Land use cartography is difficult because the dynamic range of video registration is too narrow and photographic representation of the data leads to a decisive loss of information. Gray tone and surface texture are ambiguous. Satisfactory grassland charting requires recordings obtained in different seasons. Author (ESA)

N82-32595# Fernmeldetechnisches Zentralamt, Darmstadt (West Germany).
FIELD STRENGTH PREDICTION FOR MOBILE RADIO, USING A TOPOGRAPHICAL DATA BASE
Karl Loew Feb. 1982 54 p refs In GERMAN; ENGLISH summary
(FTZ-446-TBr-5) Avail: NTIS HC A04/MF A01

A mathematical model which treats the influence of topography on electromagnetic wave transmission is presented. A computer program, used to predict the median value of electric field strength with reference to a topographical data base, is outlined. Measurements were taken at 450 MHz on test links which were about 1 km in length and surrounded by different environments (forest, urban or open area). A comparison with model predictions shows that the measured and calculated field strength levels are in good agreement even in the case of very different path profiles in the vicinity of a mobile radio. The normally distributed error (difference of computed and measured medians of the field strength) has a standard deviation of 6.4 dB. Author (ESA)

N82-32596# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
ON THE CAPACITY OF A BINARY SYMMETRIC CHANNEL WITH DELETIONS [SUR LA CAPACITE D'UN CANAL BINAIRE AVEC DESTRUCTIONS]
Philippe Godlewski Mar. 1982 16 p refs In FRENCH; ENGLISH summary Presented at Colloq. Intern. de Theorie de l'Inform., Budapest, 24-28 Aug. 1981
(ENST-C-82002) Avail: NTIS HC A02/MF A01

A capacity C which is defined asymptotically for a generalized model of a discrete channel without memory is discussed. Random deletions due to loss of synchronization are considered. The upper

and lower bounds of channel capacity with deletions are determined. A fundamental theory of channel coding with reference to this model is recommended. It is suggested that it is probable that C is an evaluator of the effective capacity, C', defined as the upper output bound of a transmission system without error.
Author (ESA)

N82-32597# Fondazione Ugo Bordoni, Rome (Italy).
CONCLUSIONS FROM THE OTS DATA ANALYSIS AT THE FUCINO STATION [CONCLUSIONI DELL'ANALISI DEI DATI OTS PRESSO LA STAZIONE DEL FUCINO]
Francesco Fedi, Aldo Paraboni (Politec. di Milan), Jose Poiares Baptista, and Sante Tirro (Telespazio S.p.A.) Oct. 1981 93 p refs In ITALIAN
(FUB-44-1981) Avail: NTIS HC A05/MF A01

Rain attenuation variations with the incidence angle of the space-ground communication beam, the long term statistical correlation between rain intensity and microwave attenuation, and the characterization of the rain depolarizing effects are considered. For each subject the theory, the results, the input data and the implementation algorithms are discussed. The probability distribution of the OTS and Sirio satellites transmission attenuation are presented. The prediction of the depolarization probability in linear polarization (TM beacon) starting from intrinsic parameters is examined and the results obtained using the implementation algorithms are included. Author (ESA)

N82-32598# Fondazione Ugo Bordoni, Rome (Italy).
STATE OF THE ART AND DEVELOPMENT POSSIBILITIES OF THE VOICE SIGNAL TRANSFER IN PACKET SWITCHED NETWORKS [STATO DELL'ARTE E PROSPETTIVE DI SVILUPPO NEGLI STUDI SUL TRASFERIMENTO DELLE VOCE IN RETI A COMMUTAZIONE DI PACCHETTO]
Wolfango Maggi and Aldo Roveri (Rome Univ.) Dec. 1981 90 p refs In ITALIAN
(FUB-48-1981) Avail: NTIS HC A05/MF A01

Literature on voice transmission in packet switched networks was reviewed. Coding techniques, like embedded coding, are discussed. The packet structure which carries the voice information is examined. Management procedures for network traffic and routing techniques are reviewed. The algorithms for the operation of the receiver are related to the identification of possible working models and to the definitions of the synchronization strategy.
Author (ESA)

N82-32599# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
THE STUDY OF A CLASSIFICATION VOCODER FOR LINEAR PREDICTION INTENDED FOR LOW RATE SPEECH TRANSMISSION Ph.D. Thesis [ETUDES POUR VOCODEUR A CLASSIFICATION PAR PREDICTION LINEAIRE EN VUE DE LA TRANSMISSION DE LA PAROLE A TRES FAIBLE DEBIT]
Antonio DeLaO Jan. 1982 240 p refs In FRENCH Sponsored by CROUS, Paris and ADEC
(ENST-E-82001) Avail: NTIS HC A11/MF A01

Coded speech transmission was studied. A speech recognition algorithm identifies the better adjusted voice signal prototype from a set of previously collected prototypes, and a binary coded signal representing the selected model is transmitted. At the reception end classical linear prediction algorithms synthesize the voice signal using a dictionary of the set of prototypes. The Chebychev distances evaluated from the filtered autocorrelations assure a good formant description in the 1 to 3kHz band. A nonlinear transformation of the cepstral distance improves considerably the reliability of this method. The results show that it is possible to synthetize speech starting from one hundred elementary signals from one speaker. Author (ESA)

N82-32600# British Aerospace Aircraft Group, Preston (England). Maths Services.
NUMERICAL APPLICATIONS OF THE PHYSICAL OPTICS APPROACH FOR THE CALCULATION OF RADAR CROSS SECTIONS OF CONVEX PERFECT SCATTERERS
P. W. Reynolds and S. Whittle Sep. 1981 81 p refs
(BAe-MSN-261) Copyright. Avail: Issuing Activity

Factors which determine the way in which an aircraft surface should be divided into geometrically simple panels, used in computerized calculation of radar cross sections, are discussed. An algorithm which evaluates the monostatic return from a planar panel was tested. Accuracy depends on panel size, shape and orientation, the length of the projection of the panel in the direction of radiation, and the difference in position between the true surface panel and the approximating plane panel. The computation speed of the computer program allows a structure with 100,000 panels to be processed in 2 min. Author (ESA)

N82-32601# Centro Studi e Laboratori Telecomunicazioni, Turin (Italy).
STUDY OF PROPAGATION PROPERTIES OF THE 50 TO 70 GHz BAND AND ITS POTENTIAL APPLICATIONS FOR SPACE COMMUNICATION SYSTEMS
E. Damosso, P. PorzioGiusto, L. Stola, and D. Tarducci Paris ESA Jan. 1982 300 p refs 2 Vol.
(Contract ESTEC-4535/80/NL-MS(SC))
(CSELT-82.01.043-Vol-1; ESA-CR(P)-1612-Vol-1) Avail: NTIS HC A13/MF A01

The transfer characteristics of the 50 to 70 GHz band are studied on the basis of the available experimental data and of the existing theories which relate the spectroscopie properties of the atmosphere to their molecular origin, in such a way that those properties may be linked to meteorological parameters. The statistical variations of these parameters and of the transfer, shielding and emission properties of the oxygen molecules at the frequencies of interest are examined in detail and the other relevant clear air effects (bending and scintillations) are discussed. Detailed numerical and graphical results are included. Author (ESA)

N82-32602# Centro Studi e Laboratori Telecomunicazioni, Turin (Italy).
STUDY OF PROPAGATION PROPERTIES OF THE 50 TO 70 GHz BAND AND ITS POTENTIAL APPLICATIONS FOR SPACE COMMUNICATION, VOLUME 2 SYSTEMS
E. Damosso, P. PorzioGiusto, L. Stola, and D. Tarducci Paris ESA Jan. 1982 138 p refs 2 Vol.
(Contract ESTEC-4535/80/NL-MS(SC))
(CSELT-82.01.043-Vol-2; ESA-CR(P)-1612-Vol-2) Avail: NTIS HC A07/MF A01

A study of the exploitation of the 60 GHz band for space communication services was carried out. In particular, the feasibility and limitations for space to stratosphere and inter-satellite digital systems at 60 GHz (20 and 40 phase shift keying) were investigated. The effects of absorption by the oxygen molecules, of water vapor absorption and the rain and cloud effects are discussed. Propagation factors (oxygen, water vapor, rain and clouds) and their impact on the measuring accuracy of space borne radar altimeters are examined at 35 and 78 GHz and comparisons are made with present radar altimeters operating in the 13.5 GHz band. Detailed numerical and graphical results are included. Author (ESA)

N82-32603# National Telecommunications and Information Administration, Boulder, Colo.
OPTICAL WAVEGUIDE COMMUNICATIONS GLOSSARY
A. G. Hanson, L. R. Bloom, A. H. Cherin (Bell Telephone Labs.), G. W. Day (NBS), R. L. Gallawa (NBS), E. M. Gray, C. Kao (ITT), F. P. Kapron (Bell Northern Research, Ltd.), B. S. Kawasaki (Communications Research Centre), P. Reitz (Corning Glass Works) et al Jan. 1982 36 p
(PB82-166257; NBS-HB-140; LC-81-600151) Avail: NTIS HC A03/MF A01 CSCL 17B

The growth of a specialized optical communications vocabulary is discussed. Some terms have been borrowed freely from the disciplines of optical physics and communications engineering; others have been coined independently. In this process, inevitably, some ambiguity and impreciseness have resulted. More significantly perhaps, some terms have been used to specify a product and

are beginnin to be accepted by manufacturers and users but are not precise descriptors beyond rather narrow limits. The absence of a precise, common language among researchers, manufacturers, systems designers, and users is a hindrance to effective technology development and utilization. The goal of this glossary is to nurture such a language. GRA

N82-32604# Foersvarets Forskingsansalt, Stockholm (Sweden).
EXPERIENCE WITH THE USE OF THE COM COMPUTERIZED CONFERENCING SYSTEM
Jacob Palme Dec. 1981 55 p refs
(PB82-169293; FOA-C-10166E-M6(H9)) Avail: NTIS HC A04/MF A01 CSCL 17B

Studies of the effect of the system are summarized. Similar computerized conferencing systems were also investigated. Information about how much KOM (the Swedish language version of COM) is used, what it is used for, which people use it, the user opinions about the advantages and disadvantages of the system, and a comparison of its cost with other communication media is presented. GRA

N82-32605# National Telecommunications and Information Administration, Annapolis, Md.
SPECTRUM RESOURCE ASSESSMENT IN THE 1215-1400 MHz BAND
Andrew Farrar Sep. 1981 100 p refs
(PB82-176512; NTIA-TR-81-83) Avail: NTIS HC A05/MF A01 CSCL 17B

A spectrum resource assessment in the 1215 to 1400 MHz band was conducted. Information on allocation, technical standards, frequency assignments, equipment characteristics and compatibility analyses which treat the EMC interaction between four firmly planned systems and a typical aeronautical radionavigation radar (ARSR-1E) is presented. Frequency distance separation guidelines for sharing between these systems were provided. Measured data obtained by the radio spectrum measurement system (RSMS) at nine different sites in the United States are presented and the data used to characterize the band usage. GRA

N82-32606# National Telecommunications and Information Administration, Annapolis, Md.
SPECTRUM RESOURCE ASSESSMENT IN THE 216-225 MHz BAND
Frederick Matos Sep. 1981 53 p refs
(PB82-176538; NTIA-TR-81-85) Avail: NTIS HC A04/MF A01 CSCL 17B

A spectrum resource assessment of the 216-225 MHz frequency band is given. Included is information on allocations, technical standards, frequency assignments and system characteristics. The 216-255 MHz band is in transition from being a radar band to mobile communications. Present and future uses of the band are examined. Recommendations are presented regarding the planning of the band and new mobile service uses. One new use proposed is the the Federal Government low power non-critical communications. GRA

N82-32607# Office of Technology Assessment, Washington, D.C.
RADIOFREQUENCY USE AND MANAGEMENT: IMPACTS FROM THE WORLD ADMINISTRATIVE RADIO CONFERENCE OF 1979
Jan. 1982 174 p refs
(PB82-177536; LC-82-600502) Avail: NTIS HC A08/MF A01 CSCL 17B

Final Acts of the General World Administrative Radio Conference are discussed in a comprehensive way describing U.s. preparations and involvement, and the impact of the conference. However, no attempt was made to examine all issues and aspects of the conference, but rather to focus on certain important ones and analyze their consequences for the United States. Alternative structures, procedures, and strategies to improve frequency spectrum planning and management to assure the United States of continued satisfaction of its commercial, Government, and national security requirements for frequency spectrum and geostationary satellite orbit locations were considered. GRA

N82-32608# Federal Communications Commission, Washington, D. C. Office of Plans and Policy.
UHF VIEWING AND TELEVISION CHANNEL SELECTOR TYPE Final Report
Steven R. Brenner, Jonathan D. Levy, and Fred J. Ruppel Feb. 1981 137 p refs
(PB82-177577) Avail: NTIS HC A07/MF A01 CSCL 17B

A statistical analysis of the relationship between UHF viewing and television channel selector type is presented. It is based on a data set that contains information on UHF, VHF, and total viewing on over 3,800 individual television receivers, information on the channel selector on each set, and information on receiver, antenna and household demographic characteristics. The data, were assembled from diaries and follow up telephone interviews. An exhaustive examination of this data set revealed no evidence of a systematic relationship between UHF viewing and channel selector type. In particular, no evidence was found that electronic channel selectors are associated with higher levels of UHF viewing. The report concludes that assertions that channel selectors have a substantial effects on UHF viewing should not be accepted in the absence of empirical evidence demonstrating the existence of a relationship. GRA

N82-32526# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.
RANDOM WAVES IN SOLID MEDIA
A. I. Beltzer *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14. No. 3 Mar. 1982 p 3-6 refs (For primary document see N82-32525 23-31)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/14

N82-32531*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DSN COMMAND SYSTEM MARK IV-85
H. C. Thorman *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 8-15 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 17B

N82-32532*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE DSN VLBI SYSTEM MARK IV-86
W. D. Chaney *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 16-20 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 17B

N82-32535*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PPM DEMODULATION FOR REED-SOLOMON DECODING FOR THE OPTICAL SPACE CHANNEL
D. Divsalar, R. M. Gagliardi, and J. H. Yuen *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 47-59 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 17B

N82-32539*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE 2.5 BIT/DETECTED PHOTON DEMONSTRATION PROGRAM: PHASE 2 AND 3 EXPERIMENTAL RESULTS
J. Katz *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 95-104 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 17B

N82-32540*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A NOTE ON DEEP SPACE OPTICAL COMMUNICATION LINK PARAMETERS
S. J. Dolinar and J. H. Yuen *In its* The Telecommun. and Data

Acquisition Report 15 Aug. 1982 p 105-109 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 17B

N82-32541*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THERMAL ANALYSIS OF ANTENNA BACKUP STRUCTURE. PART 1. METHODOLOGY DEVELOPMENT
D. Schonfeld and F. L. Lansing *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 110-116 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 20N

N82-32542*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PERFORMANCE OF AN OPTICAL RELAY SATELLITE USING REED-SOLOMON CODING OVER A CASCADED OPTICAL PPM AND BPSK CHANNEL
D. Divsalar and F. Naderi *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 117-131 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 17B

N82-32546*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GCF MARK IV DEVELOPMENT
L. O. Mortensen *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 161-172 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 17B

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N82-32609*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CHEMICAL VAPOR DEPOSITION FOR AUTOMATIC PROCESSING OF INTEGRATED CIRCUITS
Bobby W. Kennedy Jan. 1980 26 p refs
(NASA-TM-78274; NAS 1.15:78274) Avail: NTIS HC A03/MF A01 CSCL 09C

Chemical vapor deposition for automatic processing of integrated circuits including the wafer carrier and loading from a receiving air track into automatic furnaces and unloading on to a sending air track is discussed. Passivation using electron beam deposited quartz is also considered. S.L.

N82-32610# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
BANDWIDTH NARROWING IN N TYPE MANY-VALLEY SEMICONDUCTORS
M. Fabbri and A. Ferreira daSilva Jun. 1982 25 p refs Submitted for publication
(INPE-2437-PRE/138) Avail: NTIS HC A02/MF A01

The density of states is calculated for a random distribution of shallow donors in many-valley semiconductors, as well as the inverse participation ratio in the near vicinity of the Fermi energy. The N random impurities were simulated with a computer, within a diamond lattice as a host. Kohn-Luttinger donor wave function was associated with each impurity. It was found that the left energy side (or the high energy side when the effect of nonorthogonality is taken into account) of the density of states is strongly reduced to a small tail when compared to the case of neglecting many-valley effects. At the Fermi energy, the density of stares is considerably enhanced in relation to the latter case; this leads to an enhancement of the extrinsic specific heat. The inverse participation ratio varies with the impurity concentration, presenting different states which are responsible for different physical properties. An analytical calculation taking into account these effects was carried out for the sake of comparison. Author

N82-32611# Honeywell Systems and Research Center, Minneapolis, Minn. Deputy for Electronic Technology.
CCD APPLICATIONS STUDY Final Technical Report, 24 Oct. 1979 - 24 Oct. 1981
D. R. Lamb, P. C. T. Roberts, J. D. Joseph, B. Hanzal, T. T. Vu, and R. C. Reitan Griffiss AFB, N.Y. RADC Apr. 1982 78 p refs
(Contract F19628-79-C-0176)
(AD-A115637; RADC-TR-82-56) Avail: NTIS HC A05/MF A01 CSCL 09/5

Four test structures are described. The devices are a first order low pass recursive switched capacitor filter, a charge divider, an ED-NMOS operational amplifier, and an improved surface channel charge coupled device (CCD) unit delay multiplier/first order filter. Also included are the results of an experiment performed on the old surface channel CCD and an ISPICE computer simulation of a switched capacitor current-mirror half section. An inverting switched capacitor network is presented. GRA

N82-32612# Texas Univ. at Austin. Dept. of Electrical Engineering.
AN ISOLATOR IN IMAGE GUIDE
N. Camilleri and T. Itoh 11 May 1982 132 p refs
(Contract N00014-79-C-0553)
(AD-A116383; UT-MW-N-82-1) Avail: NTIS HC A07/MF A01 CSCL 09/1

An image guide consisting of a layer of dielectric and a layer of ferrite with periodic metal strips between these layers is analyzed. Non-reciprocity of the phase constants caused by the gyrotropic nature of the ferrite makes it possible to create non-reciprocal leakage phenomena by means of the metal strips. These phenomena can be used to develop a distributed isolator. Numerical results and data from the experimental investigation performed are presented. Author (GRA)

N82-32613# Ohio State Univ., Columbus.
ELECTRON DEVICE CONTACT STUDIES Final Report, 1 Nov. 1976 - 31 Mar. 1981
Philip E. Wigen and Marlin O. Thurston Wright-Patterson AFB, Ohio AFWAL May 1982 174 p refs
(Contract F33615-77-C-1002; AF Proj. 2305)
(AD-A116656; AFWAL-TR-81-1294) Avail: NTIS HC A08/MF A01 CSCL 09/3

This report describes the initial half of a program of investigation and characterization of contacts made to GaAs. A theoretical model of contact behavior based on electron tunneling is adapted to GaAs and will be used to compare experimental results of Au contacts fabricated on Sn diffused, n-type, GaAs surface layers. The fabrication of n-type layers using spin-on dopant sources and a semi closed chamber, in an open tube diffusion process are explained. The characterization of contact performance with a value of specific contact resistance, Rc, and the measurement of Rc using the transfer length method are covered. Investigation into In-au GaAs alloyed type contacts is also presented. Author (GRA)

N82-32614# M/A-COM, Inc., Burlington, Mass.
MANUFACTURING TECHNOLOGY PROGRAM FOR HIGH BURNOUT SILICON SCHOTTKY-BARRIER MIXER DIODES FOR NAVY AIR-TO-AIR AVIONICS Final Report, May 1979 - Nov. 1981
Yoginder Anand and Steven Ellis Feb. 1982 123 p refs
(Contract N00173-79-C-0107)
(AD-A116260) Avail: NTIS HC A06/MF A01 CSCL 13/8

This report describes the establishment of low cost semiconductor processes to manufacture low-barrier-height high-burnout X-band silicon Schottky barrier diodes in production quantities. These devices are thermal-compression-bonded in a rugged

low-cost pill (ODS-119) package. They exhibit an overall low noise figure of 7.0 dB (single side band) at 0.5 mW of local oscillator power level and RF burnout of 12 watts (tau = 1 microsec and 1000 Hz rep. rate). Reliability and ruggedness of the design has been demonstrated by tests taken from MIL.S 19500 F.
Author (GRA)

N82-32615# General Atronics Corp., Philadelphia, Pa.
ADAPTIVE NONLINEAR CANCELLER (ANLC) Final Technical Report, 1 Jun. 1980 - 1 Nov. 1981
Lawrence R. Burgess and David M. Cooper Griffiss AFB, N.Y. RADC Apr. 1982 66 p refs
(Contract F30602-80-C-0202; AF Proj. 2338)
(AD-A116664; RADC-TR-82-73) Avail: NTIS HC A04/MF A01 CSCL 09/5

This study was directed at the analysis and characterization of nonlinearities associated with the AFSATCOM/ALT-32H interference problem and the development of an automatic nonlinear cancellation system. Analysis included the use of power series, volterra series, and perturbation analysis to predict the generation of intermodulation products. Characterization studies included the use of variable power input two-tone or notch noise to measure IMP generation by various nonlinear devices. Manual and automatic nonlinear interference cancellation systems were designed and implemented. Experimental studies are conducted using different nonlinearities, a wide range of input powers, a wide range of frequency spectra exciting the nonlinearities, various delays and multipath before and after the nonlinearities, and a number of modulation formats. To achieve a good automatic nonlinear cancellation, the following conditions must be met: (1) A good nonlinear must be generated. (2) Amplitude versus frequency shape of the signal impinging on the interfering and reference nonlinearities are critically important for good nonlinear cancellation. (3) Interfering and reference nonlinearity types must be matched. (4) Multipath before the interfering and reference nonlinearities is critically important. A multipath difference on the order of a few feet will cause complete loss of cancellation. (5) The total power input to the interfering nonlinearity for good cancellation.
Author (GRA)

N82-32616# Westinghouse Defense and Electronic Systems Center, Baltimore, Md.
DELIDDING AND RESEALING HYBRID MICROELECTRONIC PACKAGES Final Report, 15 Feb. 1980 - 15 Dec. 1981
Wyatt F. Luce May 1982 92 p refs
(Contract DAAH01-80-C-0435)
(AD-A115776; Rept-55744-5/82) Avail: NTIS HC A05/MF A01 CSCL 09/5

The objective of this single phase MM and T contract was to develop the manufacturing technology necessary for the precision removal (delidding) and replacement (resealing) of covers on hermetically sealed hybrid microelectronic packages. The equipment and processes developed provide a rework technique which does not degrade the reliability of the package of the enclosed circuitry. A qualification test was conducted on 88 functional hybrid packages, with excellent results. A petition will be filed, accompanied by this report, requesting Mil-M-38510 be amended to allow this rework method. Author (GRA)

N82-32617# Texas Univ., Austin. Electronics Research Center.
ELECTRONICS RESEARCH AT THE UNIVERSITY OF TEXAS AT AUSTIN Annual Report, 1 Apr. 1981 - 31 Mar. 1982
Edward J. Powers 15 May 1982 118 p refs
(Contract F49620-77-C-0101; AF Proj. 2305)
(AD-A115888; AFOSR-82-0502TR; Rept-29) Avail: NTIS HC A06/MF A01 CSCL 09/1

This report summarizes progress on projects carried out at the Electronics Research Center at The University of Texas at Austin and which were supported by the Joint Services Electronics Program. In the area of Information Electronics progress is reported for projects involving: (1) nonlinear detection and estimation and (2) electronic multi-dimensional signal processing. In the Solid State Electronics area recent findings in: (1) interface reactions, instabilities and transport and (2) spectroscopic studies of metal/semiconductor and metal/metal oxide interfaces are described. In the area of Quantum Electronics progress is presented for the following projects: (1) nonlinear wave phenomena, (2) structure and kinetics of excited state molecules, and (3) collective effects in nonlinear optical interactions. In the Electromagnetics area progress in guided-wave devices for the far infrared-mm device spectrum is summarized. Author (GRA)

N82-32618# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MAGNETOSTATIC SURFACE WAVE MICROWAVE OSCILLATOR M.S. Thesis
Philip W. Linke 18 Dec. 1981 82 p refs
(AD-A115583; AFIT/GE/EE/81D-35) Avail: NTIS HC A05/MF A01 CSCL 09/5

This thesis presents an experimental analysis of a magnetostatic surface wave delay line used in a two-four gigahertz feedback loop oscillator. The analysis focused on the multimoding and mode hopping effects. The tuning rate, switching speed and quality factor were also examined. The results showed that the mode hopping behavior is a result of the interaction of the delay line delay and total loop delay. The multimoding behavior was found to be a function of the loop gain and the delay lines insertion loss, bandpass and delay. Two approaches to help reduce these undesirable effects were outlined. Author (GRA)

N82-32619# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Dept. of Electrical Engineering.
INTERNAL TRIGGERING MARX GENERATOR USING HYDROGEN THYRATRONS M.S. Thesis
Craig Lee Kimberlin and Randy Lee Lundberg Dec. 1981 70 p refs
(AD-A115580; AFIT/GE/EE/81D-31) Avail: NTIS HC A04/MF A01 CSCL 09/1

Operation of a Marx generator using hydrogen thyratrons as switches, with the switches in the upper stages of the Marx being triggered by a signal derived from the lower stages (internal triggering) was investigated. The Marx was in a negative output configuration and utilized pulse forming networks (PFN's) as the energy storage elements. Triode, 8613, thyratrons were used along with 175 nanosecond risetime, five section, E-star (E*) configured PFN's. Timing requirements and erection diagnostics were determined using a two-stage Marx, with both stages triggered from separate external sources (manual triggering). It was found improper timing led to large voltage spikes on the last stage anode and a poor output pulse shape. An attempt to trigger the second (N+1) stage from a signal in the first (Nth) stage was unsuccessful because of long tube turn-on times. A three-stage Marx was examined, with all stages triggered manually, to confirm timing requirements. Triggering the third (N+2) stage from a signal in the first (Nth) stage, with stages one and two externally triggered, was successful. Triggering the N+2 stage from the Nth stage using a four-stage Marx (four from two and three from one) was very successful. GRA

N82-32620# General Electric Co., Pittsfield, Mass.
METAL CORE EPOXY GLASS CIRCUIT BOARD EVALUATION PROGRAM Final Report
Bruce E. Inpyn Dec. 1981 68 p refs
(Contract N00163-80-C-0338)
(AD-A116040) Avail: NTIS HC A05/MF A01 CSCL 09/5

Leadless hermetic chip carriers are becoming the standard IC package. Their use in combination with epoxy glass PWB's results in unreliable solder joints because of the thermal expansion mismatch between the HCC and epoxy glass PWB. The problem is manifested when assemblies are subjected to repeated thermal excursions. This report describes an approach to reducing the CTE of the epoxy glass PWB (15 to 20 ppm/deg C) to a value close to the CTE of the ceramic HCC (6 to 7 ppm/deg C). This is accomplished by laminating a low expansion metal layer internal to the multilayer board. This stabilized MLB reduces the stresses incurred in the solder joints, and subsequently reduces the number

of fractures due to solder fatigue when thermally cycled. Test methods, test results and failure analysis are also included in this report. Author (GRA)

N82-32621# Hughes Aircraft Co., Fullerton, Calif. Engineering Services and Support Div.
ADVANCED ELECTRICAL TEST TECHNIQUES FOR LSI MICROCIRCUITS Final Technical Report, Jun. 1980 - Jun. 1981
Ted Y. Fujimoto Griffiss AFB, N.Y. RADC Mar. 1982 96 p refs
(Contract F30602-80-C-0204; AF Proj. 2338)
(AD-A115845; RADC-TR-82-2) Avail: NTIS HC A05/MF A01 CSCL 09/5

An investigation was conducted to determine the feasibility of developing new LSI test techniques using test parameters that could be directly related to the physical structure of the device. In addition, a test technique capable of detecting potential failures or increasing safe operating margins was highly desirable. Two test methods were developed and evaluated for static RAMs: (1) Flip flop cell unbalance detection and (2) time-dependent failure detection. Three test techniques were evaluated for dynamic RAMs: (1) chip enable pulse width, (2) V-BUMP, and (3) refresh time. The memory cell flip flop unbalance parameter did not correlate with any device degradation or failure under life test conditions. However the unbalance detection technique was found to be useful in detecting functionally tested time-dependent failures. The chip enable high test with a maximum pulse width, as well as with a minimum pulse width, was determined to be highly useful in evaluating the drive capability margin of the clocked dynamic circuits. The V-BUMP test for checking the sense amplifier's ability to discriminate between Os and Is in the memory cell was determined to be a highly effective safe-margin testing technique. It was found that refresh time tests at room temperatures are ineffective in screening marginal parts, therefore such tests should be accomplished at high ambient temperatures. None of the three test parameters for dynamic RAMs was able to be correlated with degradation or life test failure. GRA

N82-32622# Stanford Univ., Calif. Electronics Labs.
A FAST TURN AROUND FACILITY FOR VERY LARGE SCALE INTEGRATION (VLSI) Semiannual Technical Status Report, 1 Jul. - 31 Dec. 1981
James D. Meindl, James D. Plummer, Robert W. Dutton, R. Fabian Pease, J. Beaudouin, D. Dameron, L. Gerzberg, K. Saraswat, J. Shott, and T. Walker Fort Monmouth, N.J. Army Electronics Research and Development Command Jun. 1982 49 p refs
(Contract MDA903-80-C-0432; DARPA Order 4012)
(AD-A115863; DELET-TR-80-0432-1) Avail: NTIS HC A03/MF A01 CSCL 09/5

In order to appreciate the critical hardware and software problems associated with the definition and design of very large scale integrated circuits or integrated systems including 10 to the 4th power - 10 to the 6th power transistors in a single silicon ship, incisive experiments conducted with actual operating chips are indispensible. The objective of this project is to establish, within a university research environment, a facility for the rapid execution of mask generation, wafer fabrication, and functional testing of user-generated custom I.C. designs. Author (GRA)

N82-32623# City Univ. of New York, N. Y. Dept. of Physics.
THE ROUGH SEMICONDUCTOR ELECTRODE; A NEW PERCOLATION PROBLEM Interim Technical Report
Micha Tomkiewicz and Morrel H. Cohen Jun. 1982 19 p refs Submitted for publication Prepared in cooperation with Exxon Research and Engineering Co., Linden, N.J.
(Contract N00014-81-K-0339)
(AD-A115664; ITR-1) Avail: NTIS HC A02/MF A01 CSCL 20/12

It is shown that current flow through a rough interface with an exhaustion layer of controllable width can be idealized into a novel percolation problem. The scaling relations are formulated for a real interface and for a practical solution where the separating layer is an exhaustion layer of a semiconductor and where it can be controlled by an applied voltage. Author

N82-32624# Tennessee Univ., Knoxville. Dept. of Electrical Engineering.
EFFECTS OF GAMMA RADIATION ON SEMICONDUCTOR DEVICES FOR HIGH-TEMPERATURE ELECTRONICS M.S. Thesis
H. P. Orrick, E. J. Kennedy, and T. V. Blalock 30 Oct. 1981 81 p refs
(Contract W-7405-eng-26)
(DE-82008181; ORNL/Sub-7685/12; TR-EE/EL-14) Avail: NTIS HC A05/MF A01

Several semiconductor devices (bipolar transistors, JFETs, MOS transistors, and IC operational amplifiers), capacitors, and thick film resistors were irradiated at 10.3 to the fifth power rads/hour for total gamma doses up to 20 to the 7th power rads. Evaluations were made during and following irradiation. Devices were then annealed at 2300 C for an equivalent time period to simulate real time annealing effects on radiation damage in a high temperature environment. DOE

N82-32625# California Univ., Livermore. Lawrence Livermore Lab.
CIRCUIT ANALYSIS AND SIMULATION PROGRAMS: AN OVERVIEW
W. G. Magnuson, Jr. Oct. 1981 6 p refs Presented at the IEEE Symp. on Nucl. Sci., San Francisco, 21-23 Oct. 1981
(Contract W-7405-eng-48)
(DE82-003152; UCRL-86804; CONF-811012-33) Avail: NTIS HC A02/MF A01

Electrical circuit analysis programs used for analyzing digital and analog circuits are described. The anatomy of circuit simulator programs, analysis formulation techniques, and solution procedures are addressed. The features, capabilities, and limitations of several of the more widely used current programs are covered. DOE

N82-32626# Pirelli Cable Corp., Union, N.J.
DETERMINATION OF AC CONDUCTOR AND PIPE LOSS IN PIPE-TYPE CABLE SYSTEMS Final Report
D. A. Silver and G. W. Seman Feb. 1982 135 p refs Sponsored by Electric Power Research Inst.
(EPRI Proj. 7832-2)
(DE82-901868; EPRI-EL-2256) Avail: NTIS HC A07/MF A01

The ac/dc resistance ratios of high and extra high voltage pipe-type cables were determined. The cables investigated contained conventional and large size segmental conductors in carbon steel, stainless steel, and aluminum pipes in both three cable per pipe and single cable per pipe configurations. The measurements included 115 through 765 kV cables with copper, enamel coated copper, and aluminum conductors in sizes of 2000 kcmil (1015 sq mm), 3250 kcmil (1650 sq mm), and 3500 kcmil (1776 sq mm). Calculations using presently available techniques were employed to provide correlation between measured and calculated values in both magnetic and nonmagnetic pipes. In addition, a number of new techniques in conductor construction, pipe material and pipe liners and cable wraps were investigated as means of decreasing the ac/dc resistance ratios of pipe-type cables. Finally, the various systems studied were compared on the basis of system MVA rating and by evaluation of installed and overall operating costs as compared to conventional three cable per pipe systems installed in carbon steel pipes. DOE

N82-32627# Siemens A.G., Erlangen (West Germany). Forschungslab.
A15 PHASE SUPERCONDUCTORS WITH HIGH CURRENT CAPACITIES Final Report, Mar. 1981
Guenter Rupp, Manfred Wilhelm, and Karl Wohlleben Bonn Bundesministerium fuer Forschung und Technologie Feb. 1982 63 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-033; ISSN-0340-7608) Avail: NTIS

HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13,45

Development of Nb3Sn filamentary conductors, produced by the solid diffusion process, was continued, aiming at homogeneous properties over long length. Conductor types with stabilizing copper in the cross section were developed which are suited for cabling to conductors with high current capacities. Cables were made: all of them were fully transposed and highly compacted; length up to 2300 m and currents up to 2300 amps at 10 T and 4.2 K. The reaction conditions for Nb3Sn conductors were investigated. When hydrogen was in the annealing atmosphere, there is a change in the field dependence of the current density. The filament diameter also varies the critical current density. An apparatus was constructed and tested to spool reacted conductors. The conductors were tested on their homogeneous properties in solenoids which were made by the wind and react technique. With a NbTi coil (7 T) in a free bore of 40 mm, 15 T at 4.2 K is attained. Author (ESA)

N82-32628# Siemens A.G., Munich (West Germany). Grundlagenentwicklung Materialphysik.

CRYSTAL DEFECTS IN SILICON INTEGRATED CIRCUITS WITH RESPECT TO VERY LARGE SCALE INTEGRATION (VLSI) Final Report, Dec. 1980

Guenther Franz and Bernd Kolbesen Bonn Bundesministerium fuer Forschung und Technologie Apr. 1982 56 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-82-050; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12

The impact of process induced crystal defects on single bit refresh loss in dynamic MOS memory devices (bipolar and MOS technology) was investigated. Analytical techniques for detection of crystal defects were preferential etching, X-ray topography, and high voltage electron microscopy. Impurity levels were determined by infrared spectroscopy (carbon and oxygen) and neutron activation analysis (metals). Device characteristics and measurements of the MOS relaxation time were utilized as electrical results for quality control. Nuclei, sources and driving forces were analyzed, correlated to special technology steps, and measures for elimination were determined. Results show that metallic impurities introduced during wafer processing influence the generation as well as the electrical activity of crystal defects. The gettering ability of defects, due to the precipitation of oxygen in liquid (CZ) silicon, is explained. Author (ESA)

N82-32629# Centre Technique des Industries Mecaniques, Senlis (France).

INFORMATION ON STEPPING MOTORS Final Report [INFORMATION SUR MOTEURS PAS A PAS]

G. Fongarland 10 Apr. 1982 47 p refs In FRENCH

(CETIM-14-M-091) Avail: NTIS HC A03/MF A01

The principles of the stepping motors which are often used in servomechanisms are reviewed. Variable reluctance as well as permanent magnet stepping motors are considered. Their operation is explained which includes permanent rotation, starting, stopping, and resonance effects. Several application examples, drawn from problems in automation, are outlined. Author (ESA)

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N82-32630 Admiralty Marine Technology Establishment, Teddington (England).

COMPUTATION OF ACOUSTIC POWER, VIBRATION RESPONSE AND ACOUSTIC PRESSURES OF FLUID-FILLED PIPES

J. H. James May 1982 24 p refs

(AMTE(N)-TM-82036; BR83735) Copyright. Avail: Issuing Activity

Acoustic power radiated into the fluid around a pipe subjected to time harmonic excitation, the vibration response of the pipe wall, and the pressures in the exterior and interior fluids are computed. Pressure fields and pipe displacements are represented by Fourier transformations, and the acoustic power in the surrounding fluid is obtained from the stationary phase approximation to the far field pressure. The integral representations of fluid pressures, pipe displacements and radiated power are evaluated by a simple numerical quadrature scheme. Decibel level versus frequency plots for the responses in the individual circumferential harmonics of a water filled steel pipe surrounded by air are presented. Author (ESA)

N82-32631# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.

MOIRE DEFLECTOMETRY, A NEW METHOD FOR DENSITY GRADIENT MEASUREMENTS IN COMPRESSIBLE FLOWS

Josef Stricker and Oded Kafri (Nuclear Research Center, Beer-Sheva, Israel) Feb. 1981 22 p refs

(TAE-436) Avail: NTIS HC A02/MF A01

The use of a new method, moire deflectometry, for analysis of density gradients in compressible flows is suggested. This method, which is simpler to apply than schlieren and does not need pre-calibration, is capable of providing a fully quantitative diagnosis and maps of the density gradient field. The method is demonstrated by a quantitative example of a two-dimensional diamond airfoil in a supersonic wind-tunnel and it is compared with other diagnostic methods widely used today. Author

N82-32632# Illinois Univ., Urbana-Champaign.

CRYOGENIC MODELING OF THE HEAT TRANSFERRED BY COMBINED CONVECTION FROM A VERTICAL CYLINDER IN A HORIZONTAL FLOW Ph.D. Thesis

George Leslie Clark, Jr. 1982 209 p refs

Avail: NTIS HC A10/MF A01

A noval heat transfer technique, the use of cryogenic temperatures for convective modeling, was used to significantly extend the region of measured data for combined convection from a vertical cylinder in a horizontal flow. Reynolds numbers above 500,000, with Grashof numbers above one hundred billion were achieved in a cryogenic heat transfer tunnel which was constructed. S.L.

N82-32633*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

USE OF FIBER LIKE MATERIALS TO AUGMENT THE CYCLE LIFE OF THICK THERMOPROTECTIVE SEAL COATINGS

R. C. Hendricks and G. McDonald Aug. 1982 14 p refs Presented at Intern. Conf. on Met. Coatings and Process Technol., San Diego, Calif., 4-9 Apr. 1982; sponsored by American Vacuum Society

(NASA-TM-82901; E-1284; NAS 1.15:82901) Avail: NTIS HC A02/MF A01 CSCL 20D

Some experimental and analytical studies of plasma sprayed ZrO2-Y2O3 thick seal thermoprotective materials over NiCrAlY bond coats with testing to 1040 deg C in a Mach 0.3 burner flame are reviewed. These results indicate the need for material to have both compliance and sufficient strength to function successfully as a thick thermoprotective seal material. Fibrous materials may satisfy many of these requirements. A preliminary analysis simulating the simplified behavior of a 25 mm cylindrical SiO2-fiber material indicated significant radial temperature gradients, a relatively cool interace and generally acceptable stresses over the initial portion of the thermal cycle. Subsequent testing of these fiberlike materials in a Mach 0.3 Jet A/air burner flame confirmed these results. Author

N82-32634*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TURBULENT SOLUTION OF THE NAVIER-STOKES EQUATIONS FOR UNIFORM SHEAR FLOW

R. G. Deissler 1981 31 p refs Presented at the Fluid Dyn. Meeting of the Am. Phys. Soc., Monterey, Calif., 23-24 Nov. 1981
(NASA-TM-82925; E-1202; NAS 1.15:82925) Avail: NTIS HC A03/MF A01 CSCL 20D

To study the nonlinear physics of uniform turbulent shear flow, the unaveraged Navier-Stokes equations are solved numerically. This extends our previous work in which mean gradients were absent. For initial conditions, modified three-dimensional-cosine velocity fluctuations are used. The boundary conditions are modified periodic conditions on a stationary three-dimensional numerical grid. A uniform mean shear is superimposed on the initial and boundary conditions. The three components of the mean-square velocity fluctuations are initially equal for the conditions chosen. As in the case of no shear the initially nonrandom flow develops into an apparently random turbulence at higher Reynolds number. Thus, randomness or turbulence can apparently arise as a consequence of the structure of the Navier-Stokes equations. Except for an initial period of adjustment, all fluctuating components grow with time. The initial equality of the three intensity components is destroyed by the shear, the transverse components becoming smaller than the longitudinal one, in agreement with experiment. Also, the shear creates a small-scale structure in the turbulence. The nonlinear solutions are compared with linearized ones. Author

N82-32635*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
FINITE ELEMENT ANALYSIS OF AERODYNAMIC HEATING IN THREE DIMENSIONAL VISCOUS HIGH SPEED COMPRESSIBLE FLOW: AN ASSESSMENT
Ken Morgan and Earl A. Thornton Aug. 1982 25 p refs
(Grant NsG-1312)
(NASA-CR-169320; NAS 1.26:169320) Avail: NTIS HC A02/MF A01 CSCL 20D

The current capability of the finite element method for solving problems of viscous flow is reviewed. Much work has been directed to the simulation of incompressible flows and the relevant features are described. The methods available for, and the problems associated with, the finite element solution of high speed viscous compressible flows are analyzed. A plan for developing finite element research in this area with experimental support is presented. Author

N82-32636*# Old Dominion Univ., Norfolk, Va. Dept. of Engineering and Mechanics.
A NUMERICAL SIMULATION OF TRANSITION IN PLANE CHANNEL FLOW Final Report, 1 Oct. 1981 - 30 Sep. 1982
G. Goglia and S. Biringen Aug. 1982 48 p refs
(Grant NAG1-228)
(NASA-CR-169322; NAS 1.26:169322) Avail: NTIS HC A03/MF A01 CSCL 20D

A numerical simulation of the final stages of transition to turbulence in plane channel flow at a Reynolds number of 7500 is described. Three dimensional, incompressible Navier-Stokes equations are numerically integrated to obtain the time evolution of two and three dimensional finite amplitude disturbances. Computations are performed on the CYBER-203 vector processor for a 32 by 33 by 32 grid. Solutions indicate the existence of structures similar to those observed in the laboratory and which are characteristic of various stages of transition that lead to final breakdown. Details of the resulting flow field after breakdown indicate the evolution of streak-like formations found in turbulent flows. Although the flow field does approach a steady state (turbulent channel flow), implementation of subgrid-scale terms are necessary to obtain proper turbulent statistics. Author

N82-32637*# Boeing Military Airplane Development, Seattle, Wash.
ERROR NORMS FOR THE ADAPTIVE SOLUTION OF THE NAVIER-STOKES EQUATIONS Final Report
C. K. Forester May 1982 56 p refs
(Contract NAS1-16408)
(NASA-CR-165828; NAS 1.26:165828) Avail: NTIS HC A04/MF A01 CSCL 20D

The adaptive solution of the Navier-Stokes equations depends upon the successful interaction of three key elements: (1) the ability to flexibly select grid length scales in composite grids, (2) the ability to efficiently control residual error in composite grids, and (3) the ability to define reliable, convenient error norms to guide the grid adjustment and optimize the residual levels relative to the local truncation errors. An initial investigation was conducted to explore how to approach developing these key elements. Conventional error assessment methods were defined and defect and deferred correction methods were surveyed. The one dimensional potential equation was used as a multigrid test bed to investigate how to achieve successful interaction of these three key elements. S.L.

N82-32638*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
USER'S GUIDE FOR THE COMPUTER CODE COLTS FOR CALCULATING THE COUPLED LAMINAR AND TURBULENT FLOW OVER A JOVIAN ENTRY PROBE
Ajay Kumar (Old Dominion Univ.) and Randolph A. Graeves Jun. 1980 98 p refs
(NASA-TM-81848; NAS 1.15:81848) Avail: NTIS HC A05/MF A01 CSCL 20D

A user's guide for a computer code 'COLTS' (Coupled Laminar and Turbulent Solutions) is provided which calculates the laminar and turbulent hypersonic flows with radiation and coupled ablation injection past a Jovian entry probe. Time-dependent viscous-shock-layer equations are used to describe the flow field. These equations are solved by an explicit, two-step, time-asymptotic finite-difference method. Eddy viscosity in the turbulent flow is approximated by a two-layer model. In all, 19 chemical species are used to describe the injection of carbon-phenolic ablator in the hydrogen-helium gas mixture. The equilibrium composition of the mixture is determined by a free-energy minimization technique. A detailed frequency dependence of the absorption coefficient for various species is considered to obtain the radiative flux. The code is written for a CDC-CYBER-203 computer and is capable of providing solutions for ablated probe shapes also. B.W.

N82-32639# Tennessee Univ., Knoxville. Dept. of Engineering Science and Mechanics.
RESEARCH ON A FINITE ELEMENT NUMERICAL ALGORITHM FOR THE THREE-DIMENSIONAL NAVIER-STOKES EQUATIONS Final Technical Report, 1 Oct. 1978 - 30 Sep. 1981
A. J. Baker Wright-Patterson AFB, Ohio AFWAL Apr. 1982 113 p refs
(Grant AF-AFOSR-0005-79; AF Proj. 2307)
(AD-A116018; AFWAL-TR-82-3012) Avail: NTIS HC A06/MF A01 CSCL 20/4

The objective of this research project was to derive and evaluate accurate and efficient numerical solution algorithms for the three-dimensional Navier-Stokes equations. As a consequence of this objective, a generalized coordinates, implicit finite element numerical algorithm has been established for the problem class. The theoretical basis utilizes a Galerkin-Weighted Residuals statement, rendering the semi-discrete approximation error orthogonal to the finite element subspace, augmented with a penalty constraint forcing orthogonality of the gradient of this error as well. As a consequence, the algorithm possesses highly phase selective dissipation mechanisms permitting accurate resolution of solutions exhibiting a high degree of non-smoothness. A Fourier stability analysis yields an estimate of the dissipation parameter set, which is then refined to enhance the accuracy of a shocked flow prediction. Multiple factors affecting solution accuracy, convergence and efficiency have been examined. The generalized coordinates framework directly facilitates matching of arbitrary surface descriptions of the solution domain for complete geometric versatility. GRA

N82-32640# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Physical Sciences Branch.
ON THE TEMPERATURE DISTRIBUTION IN AN AIR-

VENTILATED SNOW LAYER
Yin-Chao Yen Mar. 1982 16 p refs
(DA Proj. 4A1-61102-AT-24)
(AD-A115598; CRREL-82-5) Avail: NTIS HC A02/MF A01 CSCL 08/12

The problem of simultaneous heat and mass transfer in a homogeneous snow layer, with one side kept at its initial temperature and the other side with a step temperature increase, was solved for the case of constant through-flow conditions. An experimentally determined effective thermal conductivity function, i.e. Ke = 0.0014 + 0.58 G (where G is dry mass flow rate of air in g/sq cm-s), was employed in the solution. The computed nondimensional temperature distribution agreed quite well with experimental data taken under pseudo-steady state conditions with the exception of the temperature for the lowest flow rate used in the experiment. The pronounced nonlinearity of the temperature distribution was found to be a strong function of the flow rate. For sinusoidal variation of atmospheric pressure, the responding flow in the snow medium was also found to be sinusoidal. In conjunction with the diurnal temperature change, this variation facilitated the process of repeated sublimation and condensation in alternate directions and thereby produced a surface layer of approximately constant snow density. Author (GRA)

N82-32641# Colorado Univ., Boulder. Dept. of Mechanical Engineering.
FLOW OF GAS-PARTICLE MIXTURES Final Report, 1 Oct. 1976 - 30 Sep. 1981
Melvin C. Branch Nov. 1981 10 p refs
(Grant AF-AFOSR-3103-77; AF Proj. 2308)
(AD-A115921; AFOSR-82-0506TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

Two-phase supersonic flows dominate the structure of exhaust plumes of rocket engines with metallized propellants. Recent study has focuses on the prediction of the characteristics of these exhaust plumes in order to evaluate plume visibility, radiation signatures and impingement effects. The objective of this study is to provide new experimental data on particle concentration, size distribution, transport effects, and particle interactions with shock waves in two phase jets. Progress in these measurements is decided in this annual scientific report. Author (GRA)

N82-32642# Air Force Academy, Colo. Dept. of Aeronautics.
SEVEN-HOLE PROBE DATA ACQUISITION SYSTEM Final Report, 1 Oct. 1980 - 30 Sep. 1981
A. Gerner, C. L. Maurer, G. Sisson (Hewlett-Packard, Fort Collins, Colo.), T. Bolick, and F. Jonas 18 Nov. 1981 101 p refs
(AD-A115971; USAFA-TN-81-8) Avail: NTIS HC A06/MF A01 CSCL 09/2

This technical note consists of two separate papers. The first covers the compressible calibration of the seven-hole probe and is a reprint of an article in the Aeronautics Digest - Fall/Winter 1980, USAFA-TR-81-4. The second paper describes the associated software for the data acquisition system and contains program listings. Together, the two papers describe the entire data acquisition system developed to measure flow field properties quickly and economically in wakes using the seven-hole probes. GRA

N82-32643# Ohio State Univ., Columbus. Dept. of Aeronautical and Astronautical Engineering.
FLUID DYNAMICS OF MULTIPLE NOZZLE ARRAYS Final Report, 1 Jun. 1980 - 31 May 1981
Stuart L. Petrie 13 May 1982 8 p refs
(Grant AF-AFOSR-0216-80; AF Proj. 2307; RF Proj. 762187/712893)
(AD-A115897; AFOSR-82-0490TR; LPN-OSURF-762187/712893) Avail: NTIS HC A02/MF A01 CSCL 20/4

Theoretical and experimental research has been conducted to investigate the fluid dynamic interactions present in the supersonic free shear layers typical of those in multiple nozzle arrays. Steady state and fluctuating temperature measurements were made with an electron beam in an arc-heated wind tunnel and the results were compared with those from various turbulence models. Author (GRA)

N82-32644# Pennsylvania State Univ., University Park. Applied Research Lab.
BUBBLE DYNAMICS AND RESULTING NOISE FROM TRAVELING BUBBLE CAVITATION
R. C. Marboe 13 Apr. 1982 126 p refs
(Contract N00024-79-C-6043)
(AD-A115837; ARL/PSU/TM-82-94) Avail: NTIS HC A07/MF A01 CSCL 20/4

The acoustic noise spectrum associated with traveling bubble cavitation on a Schiebe headform in a variable pressure water tunnel was measured over the 2.5 to 80 kHz frequency range. Bubble dynamics were observed through video taping and the nuclei distribution was obtained holographically. Observed noise spectra showed that low frequency noise can be modeled by incompressible theory. High frequency noise, apparently resulting from a shock wave, can be modeled by compressible theory. The spectrum was seen to shift toward lower frequencies than predicted possibly due to axisymmetric bubble collapse. The spectral energy per bubble was experimentally derived and was found to be a reasonable approximation to that predicted by incompressible theory over the cavitation number range tested. The collapse peak pressure amplitude distribution, the maximum bubble radius distribution and the nuclei distribution were all found to be lognormal. Author (GRA)

N82-32645# Scientific Research Associates, Inc., Glastonbury, Conn.
NAVIER-STOKES COMPUTATIONS OF AFT END FLOW FIELDS Final Report, 15 Dec. 1978 - 14 Mar. 1982
Bernard C. Weinberg, Henry McDonald, and Stephen J. Shamroth May 1982 91 p refs
(Contract DAAG29-79-C-0003)
(AD-A115796; ARO-15905.1-EG) Avail: NTIS HC A05/MF A01 CSCL 20/4

A Navier-Stokes code to solve the aft end flow field of missile type configurations is presented. The consistently split linearized block implicit method of McDonald and Briley is employed in modified form to handle L-shaped domains with sharp reentrant corners. Appropriate boundary conditions are applied for the supersonic flow in particular at the outer boundary so that waves generated within the flow field are allowed to pass out of the computational domain without reflecting back into it. An adaptive grid option has been incorporated into the code and has been exercised by following the shear layer in a model backstep problem. Results are presented for the supersonic turbulent flow over a nozzle boattail configuration with and without jet exhaust and the results are compared with experiment. Calculations of the 2-D turbulent supersonic flow over a right angle back step with shear layer reattachment on a 20 deg ramp are also shown, and compared with experiments. The computation shows the qualitative physical behavior of the flows and there is generally good agreement with the experimental velocity profiles through most of the free shear layer and the ramp reattachment zone. Author (GRA)

N82-32646# Chase (David M.), Inc., Boston, Mass.
FURTHER MODELING OF TURBULENT WALL PRESSURE ON A CYLINDER FOR ARBITRARY BOUNDARY-LAYER THICKNESS
C. F. Noiseux and D. M. Chase Apr. 1982 19 p refs
(Contract N00014-80-C-0730)
(AD-A115759; TM-23) Avail: NTIS HC A02/MF A01 CSCL 20/4

The relation of the harmonic spectral densities p sub m (k, omega) of wall pressure on a cylinder in incompressible parallel flow to pure turbulent-stress sources at highly nonconvective (low) wavenumbers is formulated for arbitrarily large values of absolute value of ka and absolute value of k delta, as needed in application to towed-array noise. For the axisymmetric component of actual concern, the result to zero order in kU sub infinity omega is used

in conjunction with model properties of the source spectra assumed in earlier work to characterize the dependence of the wall-pressure spectrum p sub o (k, omega) were absolute value of k delta> or approx 1. The results tend to confirm, within the uncertainty of the source modeling, the kind of multiplicative dependence of p sub (k, sub o) on ka embodied in the current semiempirical model.

N82-32647# State Univ. of New York at Buffalo, Amherst. Lab. for Power and Environmental Studies.
ACOUSTIC AND HYDRODYNAMIC TURBULENCE-TURBULENCE INTERACTION AND ITS INFLUENCE ON ACOUSTIC PARTICULATE AGGLOMERATION
P. S. Lee, M. T. Cheng, and D. T. Shaw 1981 31 p refs
(Contract DE-AC21-79MC-11842)
(DE82-010920; DOE/MC-11842/T9) Avail: NTIS HC A03/MF A01

The potential application of acoustic agglomeration of aerosols in industry are usually under high flow rate conditions. The acoustic hydrodynamic turbulence-turbulence interaction in a resonance tube is studied. Measurements are made at both loop and node positions with a sound pressure level of 161.5 dB (re 20 (SIBMA)Pa) and the hydrodynamic Reynolds number Re ranging from 0 to 14,000. Important parameters of the final state such as the rms turbulent velocity, the integral scale, the Taylor and Kolmogorov microscales and the rate of turbulent energy dissipation epsilon are estimated. It is found that as long as the hydrodynamic flow is turbulent epsilon increases monotonically with increasing values of Re. DOE

N82-32648# State Univ. of New York at Buffalo, Amherst. Lab. for Power and Environmental Studies.
SIMILARITY CONSIDERATIONS FOR ACOUSTIC AGGLOMERATION
S. Patel and D. T. Shaw 1980 11 p refs
(Contract DE-AC21-79MC-11842)
(DE82-007976; DOE/MC-11842/T8) Avail: NTIS HC A02/MF A01

Acoustic agglomerators work, not only in reducing the total number concentration but also to effectively shift the size distribution to a larger size range depending on the frequency and intensity applied to the particular particle size distribution. The acoustic agglomerator is like any other conventional particulate abatement device from the viewpoint, that the design, materials and construction are dictated solely for that particular application and given system conditions. In addition, the acoustic agglomerator has to be tuned to that specific application for best results. In spite of the low efficiencies of sound generators, the total energy consumption is small, rapidly increasing at the higher sound intensity levels where turbulence dominates, wherein the amount of useful energy for agglomeration is smaller relative to the input acoustic energy, although it is counter benefitted by the increase in the rate of agglomeration and removal. Thus it is the availability of space and costs which inherently decides the rates of agglomeration and removal which indirectly determines the intensity levels to be used. DOE

N82-32649# California Univ., Berkeley. Lawrence Berkeley Lab.
MEASUREMENTS OF HEAT TRANSFER TO HELIUM II AT ATMOSPHERIC PRESSURE IN A CONFINED GEOMETRY
R. P. Warren and S. Caspi Aug. 1981 10 p refs Presented at Cryogenic Engr. Conf., San Diego, 10 Aug. 1981
(Contract W-7405-eng-48)
(DE82-001752; LBL-13053; CONF-810835-33) Avail: NTIS HC A02/MF A01

The enhanced heat removal capability of unsaturated superfluid helium 2 as used in fusion and accelerator dipole magnets was investigated. In superfluid the internal convection mechanism dominates the heat removal process and orientation with respect to gravity becomes of secondary importance. Heat transfer, can be influenced by the thermodynamic state of the liquid, especially with regard to possible phase transformations. The transformation from nonsaturated He 2 must involve an He 1 state before the film boiling transition is experienced. The attenuation of heat transfer within the restrictive geometry of typical magnet designs was measured. Cooling passages between turns result from gaps between the electrical insulation, and are typically on the order of a fraction of a millimeter. DOE

N82-32650# Oregon State Univ., Corvallis.
HEAT AND MASS TRANSFER IN UNSATURATED POROUS MEDIA Final Report
S. W. Childs and G. Malstaff Feb. 1982 183 p refs
(Contract DE-AC06-76RL-01830)
(DE-82008519; PNL-4036) Avail: NTIS HC A09/MF A01

A preliminary study of heat and water transport in unsaturated porous media is presented. Background information regarding the feasibility of seasonal thermal energy storage in unconfined aquifers is provided. A parametric analysis of the factors of importance, and an annotated bibliography of research findings pertinent to unconfined aquifer thermal energy storage are presented. This analysis shows that heat and mass transfer of water vapor assume dominate importance in unsaturated porous media at elevated temperature. Although water vapor fluxes are seldom as large as saturated medium liquid water fluxes, they are important under unsaturated conditions. The major heat transport mechanism for unsaturated porous media at temperatures from 50 to 900C is latent heat flux. The mechanism is nonexistent under saturated conditions but may well control design of unconfined aquifer storage systems. The parametric analysis treats detailed physical phenomena which occur in the flow systems study and demonstrates the temperature and moisture dependence of the transport coefficients of importance. DOE

N82-32651# Texas Univ., Austin. Center for Energy Studies.
RESERVOIR PERFORMANCE IN VISCOELASTIC POROUS MEDIA
F. M. Rago, H. Ohkuma, K. Sepehrnoori, and T. W. Thompson Jan. 1982 37 p refs
(Contract DE-AC08-79ET-27112)
(DE-82011899; DOE/ET-27112/1) Avail: NTIS HC A03/MF A01

The mass balance equations for a two-phase two-component fluid system are written for viscoelastic porous media. The resulting equations are approximated by finite differences and the resulting numerical simulator is used to conduct sensitivity study on the effects of uniaxial viscoelastic deformation in geopressured aquifers. Results of this study indicate that viscoelastic deformation may have considerable influence on the pressure maintenance of these aquifers. A numerical model of the geopressured aquifer in Brazoria County, Texas, is constructed and the numerical simulator is used to predict the ultimate recovery of solution gas from this viscoelastic geopressured aquifer. DOE

N82-32652# Riso National Lab., Roskilde (Denmark).
ON THE FINITE LINE SOURCE PROBLEM IN DIFFUSION THEORY
T. Mikkelsen, I. Troen, and S. E. Larsen Sep. 1981 18 p refs
(DE82-700693; RISO-M-2309; ISBN-87-550-0792-9; ISSN-0418-6435) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A simple formula for calculating dispersion from a continuous finite line source, placed at right angles to the mean wind direction, is derived on the basis of statistical theory. Comparison is made with the virtual source concept usually used and this is shown to be correct only in the limit where the virtual time lag T sub v is small compared to the time scale of the turbulence t sub l. DOE

N82-32653# Aquila Univ. (Italy). Ist. di Meccanica e Macchine.
SMALL DEVIATIONS FROM LOCAL EQUILIBRIUM FOR A PROCESS WHICH EXHIBITS HYDRODYNAMICAL BEHAVIOR
A. DeMasi, N. Ianiro, and E. Presutti (Rome Univ.) Nov. 1981 52 p refs
(Publ-57) Avail: NTIS HC A03/MF A01

Deviations from local equilibrium in a symmetric simple exclusion process are studied. Properties which mimic the hydrodynamical behavior of real physical systems are underlined. The only extremal invariant measures are the Bernoulli measures.

Each measure in a suitable class, after a macroscopic time, at a zero order approximation, by a Bernoulli measure with parameter depending on macroscopic space and time. The so defined equilibrium profile satisfies the heat equation. It is proven that at first order, the state is the Gibbs phenomenon with one and two body potentials. Potential strength depends only on macroscopic space and time and on the equilibrium profile. The one body potential is linear (on the microscopic positions of the particles) and proportional to the macroscopic space gradient of the equilibrium parameter at that time, so that Fourier law holds. The two body potential varies on a macroscopic scale and is not dependent on the microscopic positions of the particles, which is given by the value of the covariance of the Gaussian macroscopic density fluctuation field. Author (ESA)

N82-32654# Centre Technique des Industries Mecaniques, Senlis (France).

BIBLIOGRAPHICAL ANALYSIS OF CALCULATION METHODS FOR HEAT EXCHANGERS: CALCULATION METHODS USED IN NON-FRENCH COMPUTER PROGRAMS [ANALYSE BIBLIOGRAPHIQUE DES METHODES DE CALCUL D'ECHANGEURS DE CHALEUR. QUATRIEME PARTIE: METHODES DE CALCUL UTILISEES DANS LES CODES ETRANGERS]

F. Sweiller 2 Jun. 1980 126 p refs In FRENCH
(CETIM-14-B-030) Avail: NTIS HC A07/MF A01

A bibliography of eight computer programs for structural and mechanical calculations relative to tube heat exchangers is presented. Hypotheses common to all eight programs are (1) the heat exchanger is axisymmetric; (2) thin plate theory is applicable; (3) the base plate has constant thickness and diameter; (4) the tubes are identical and evenly distributed; (5) the reactions of the tubes on the plate are considered as continually varying over the whole surface of the plate; (6) and that only forces due to fluid pressure, differential dilation between the tube bundle and base plate, and plate/base plate connection are considered. The programs are described and their application is criticized.
Author (ESA)

N82-32655# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

MORPHOLOGICAL AND QUANTITATIVE RESULTS OF AN INVESTIGATION OF AN UNSTABLE VORTEX RING WHOSE OSCILLATION IN THE TURBULENT FLOW STATE IS ENHANCED BY A FREE JET [MORPHOLOGISCHE UND QUANTITATIVE UNTER SUCHUNGSERGEBNISSE BEZUEGLICH EINES INSTABILEN RINGWIRBELS, DESSEN SCHWINGUNG IM TURBULENTEN STROEMUNGSZUSTAND DURCH EINEN FREISTRAHL VERSTAERKT WIRD]

Peter E. M. Schneider Feb. 1982 48 p refs In GERMAN
(MPIS-4/1982; ISSN-0436-1199) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10,20

A vortex ring formed at an annular nozzle mouth by impulse like fluid ejection was studied. Translation velocity, ratio of delay to self acceleration, vortex ring diameter and instability wave amplitude were measured as a function of place and time. Instability wave characteristics were determined. Oscillation form and frequency, distance between points of same oscillation phase and oscillation phase velocity were observed, measured and calculated. The translation velocity decreases continuously, but increases at the beginning of the instability and when the turbulent vortex ring is influenced by the free jet. It decreases again after the acceleration phase. The equilibrium diameter remains constant in the laminar and turbulent domain, but increases in the vortex oscillation domain. The change into the turbulent state starts locally and spreads out along the vortex central domain. Under the influence of the free jet a triangle-hexagon-triangle oscillation is observed, and without free jet a triangle dodecagon-hexagon oscillation is observed. Author (ESA)

N82-32656# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

EXPERIMENTAL INVESTIGATION OF THE DEPENDENCE OF THE DISTANCE BETWEEN TWO SUCCESSIVE RING VORTEXES ON THE GAS FLOW AND THE INJECTED LOUDSPEAKER SOUND IN A BURNING FREE JET FROM A RECTANGULAR SLIT [EXPERIMENTELLE UNTERSUCHUNG DER ABHAENGIGKEIT DES ABSTANDS ZWEIER AUFEINANDERFOLGENDER RINGWIRBEL VOM GASFLUSS UND VOM EINGESTRAHALTEN LAUTSPRECHERSCHALL BEI EINEM AUS EINEM RECHTECKIGEN SCHLITZ BRENNENDEN FREISTRAHL]

Peter E. M. Schneider Mar. 1982 91 p refs In GERMAN
(MPIS-5/1982; ISSN-0436-1199) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21,45

The distance between two successive turbulent vortex rings in a burning free gas jet influenced by sound was investigated. It is observed that, independently of the sound amplitude, the distance increases with increasing outlet velocity at the nozzle opening, with decreasing sound frequency, and with increasing length of the shortest side of a rectangular slit opening.
Author (ESA)

N82-32657# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.

CHEMICAL REACTION IN TURBULENT FLUIDS

D. Brian Spalding Jun. 1982 51 p refs Presented at 4th PCH Conf., New York City, Jun. 1982
(CFD/82/8) Avail: NTIS HC A04/MF A01

Approaches to the analysis of turbulent combustion are reviewed. In the deductive approach (1) mathematics alone is relied upon to predict turbulent-reaction phenomena from the established fundamental physical and chemical laws. In approach (2) phenomena are named and systematically observed, in order to establish qualitative and quantitative regularities. In (3) features which can be recognized as present, albeit with widely varying degrees of prominence, in reactive flows of different kinds, are studied. It is argued that method (1) is extremely limited by computing technology, and that it is hard to extend (2) beyond its present level. It is also argued that turbulent reaction studies reveal inadequacies in the theory of hydrodynamic turbulence on which they rest. Ways in which these inadequacies can be removed by the exploitation of analogies between turbulence and multiphase flows are discussed. Author (ESA)

N82-32658# National Bureau of Standards, Washington, D.C. Center for Building Technology.

ENTRY TRANSITION WATER SURFACE PROFILE PREDICTION IN SUPERCRITICAL PARTIALLY FILLED PIPE FLOW

J. A. Swaffield Jul. 1981 107 p refs Prepared in cooperation with Brunel Univ.
(Contract HUD-H-4878)
(PB82-175068; NBSIR-81/2290; HUD-0002121) Avail: NTIS HC A06/MF A01 CSCL 20D

The criteria governing the development of steady partially filled supercritical pipe flow are presented together with the necessary techniques to determine the water surface profile in the pipe entry transition length. The establishment of full bore flow is predicted for a range of flow rates and pipe design parameters. Based on the water surface profile calculation technique, the report presents pipe length predictions to avoid the air pressure fluctuations in the drainage system that result from full bore flow establishment. Findings allow design decisions to be made that link pipe slope, diameter, and roughness to the need to avoid full bore flow. A graphical technique is also presented that removes the necessity to interpolate from the tabular data. The effect of entry geometry loss coefficients is included. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N82-32659* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LOW INTENSITY X-RAY AND GAMMA-RAY SPECTROMETER Patent

Lo I. Yin, inventor (to NASA) Issued 17 Aug. 1982 13 p Filed 30 Jul. 1980 Supersedes N80-29635 (18 - 20, p 2699)
(NASA-Case-GSC-12587-1; US-Patent-4,345,153; US-Patent-Appl-SN-173524; US-Patent-Class-250-369) Avail: US Patent and Trademark Office CSCL 20F

A low intensity X-ray and gamma ray spectrometer for imaging, counting, and energy resolving of single invisible radiation particles is described. The spectrometer includes a converting device for converting single invisible radiation particles to visible light photons. Another converting device converts the visible light photons to photoelectrons. A fiber optics coupling device couples together the two converting devices. An intensifying device intensifies the photoelectrons by an average gain factor of between 10 to the 4th power and 10 to the 7th power. The tensifying device is an anti-ion feedback microchannel plate amplifier which is operated substantially below saturation. A displaying device displays the intensified photoelectrons. The displaying device 32 indicates the spatial position, number, and energy of the incoming single invisible radiation particles.

Official Gazette of the U.S. Patent and Trademark Office

N82-32660 Y-ARD Ltd., Glasgow (Scotland).

ELECTRONIC DISPLAY DEVICES ASSESSMENT AND MARKET SURVEY

B. Couper, A. D. Hughes, A. W. MacDonald, and J. B. McHale 22 Jan. 1981 220 p refs
(YM.3338/80; BR78872) Avail: Issuing Activity

Technical, physiological, and psychological data on display technology selection and performance are given. Light emitting diodes, liquid crystal displays, gas discharge displays, electroluminescent displays, incandescent displays, and electrochemical displays are covered. Visual display units are discussed.

Author (ESA)

N82-32661*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

STRAIN GAGE CALIBRATION Patent Application

Thomas C. Moore, inventor (to NASA) Filed 27 Apr. 1982 15 p
(NASA-Case-LAR-12743-1; US-Patent-Appl-SN-372279) Avail: NTIS HC A02/MF A01 CSCL 14B

A temporary bonding system for accurately predetermining the individual apparent strain curve characteristics of the gages is used, and subsequently employs a computer to match the apparent strain curves of the individual gages to determine which gages should be used together on transducers. The temporary bonding system requires a test block on which the gages are temporarily bonded, several thermocouples for monitoring temperature, and a data acquisition system for recording apparent strain data. Initially, a group of strain gages are attached to the test block using a bonding agent that disintegrates at high temperatures. The gages are then wired to an appropriate data acquisition system and data collected throughout a predetermined temperature excursion. Once the data is obtained, the test block is heated until the bonding agent disintegrates, freeing the gages from the test block. The gages are then disconnected from the data acquisition system and cleaned, thereby ready for use on transducers. NASA

N82-32662*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXTENDING THE FREQUENCY OF RESPONSE OF LIGHTLY DAMPED SECOND ORDER SYSTEMS: APPLICATION TO THE DRAG FORCE ANEMOMETER

Gustave C. Fralick Aug. 1982 26 p refs
(NASA-TM-82927; E-1178; NAS 1.15:82927) Avail: NTIS HC A03/MF A01 CSCL 14B

It is shown that a conventional electronic frequency compensator does not provide adequate compensation near the resonant frequency of a lightly damped second order system, such as the drag force anemometer. The reason for this is discussed, and a simple circuit modification is presented which overcomes the difficulty. The improvement is shown in theoretical frequency response curves as well as in the experimental results from some typical drag force anemometers. Author

N82-32663*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

FLOW VISUALIZATION AND LASER VELOCIMETRY FOR WIND TUNNELS

William W. Hunter, Jr., ed. and Jerome T. Foughner, Jr., ed. Sep. 1982 354 p refs Workshop held in Hampton, Va., 25-26 Mar. 1982
(NASA-CP-2243; L-15498; NAS 1.55:2243) Avail: NTIS HC A16/MF A01 CSCL 14B

The need for flow visualization and laser velocimetry were discussed. The purpose was threefold: (1) provide a state-of-the-art overview; (2) provide a forum for industry, universities, and government agencies to address problems in developing useful and productive flow visualization and laser velocimetry measurement techniques; and (3) provide discussion of recent developments and applications of flow visualization and laser velocimetry measurement techniques and instrumentation systems for wind tunnels including the 0.3-Meter Transonic Cryogenic Tunnel. For individual titles, see N82-32664 through N82-32698.

N82-32664*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

PROVISIONS FOR NONINTRUSIVE FLOW-EVALUATION TOOLS IN THE NATIONAL TRANSONIC FACILITY

Dennis E. Fuller *In its* Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 1-8 refs (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

The national transonic facility fan driven, closed circuit, continuous flow, pressurized wind tunnel is examined. The test section is 2.500 m x 2.500 m and 7.620 m long with a slotted wall configuration. There are six slots each in the top and bottom walls and two slots per sidewall. To maintain good flow quality and aerodynamic efficiency over the wide range of test capabilities the test section geometry is variable. The position of the test section and bottom walls, the reentry flaps at the rear of the test section slots, and the step height for reentering slot flow are remotely controlled. The test gas may be dry air or nitrogen, which for the elevated temperature (340 K) mode of operation the test medium is normally air, and heat removal is by a water cooled heat exchanger (cooling coil) located at the upstream end of the settling chamber. For the cryogenic mode of operation, heat removal is by evaporation of liquid nitrogen, which is sprayed into the circuit upstream of the fan. By utilizing liquid nitrogen as a coolant, the tunnel test temperature range is variable from 340 to 78 K. When nitrogen is injected into the circuit, venting must occur to maintain a constant pressure. Thermal insulation is installed internal to the pressure shell to minimize energy consumption. E.A.K.

N82-32665*# Princeton Univ., N. J.

THE STATE OF THE ART OF CONVENTIONAL FLOW VISUALIZATION TECHNIQUES FOR WIND TUNNEL TESTING

Gary S. Settles *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 9-26 (For primary document see N82-32663 23-35)

Avail: NTIS HC A16/MF A01 CSCL 14B

Conventional wind tunnel flow visualization techniques which consist of surface flow methods, tracers, and optical methods are presented. Different surface flow methods are outlined: (1) liquid films (oil and fluorescent dye and UV lighting, renewable film via porous dispenser in model, volatile carrier fluid, cryogenic colored oil dots, oil film interferometry); (2) reactive surface treatment (reactive gas injection, reversible dye); (3) transition and heat transfer detectors (evaporation, sublimation, liquid crystals, phase change paints, IR thermography); and (4) tufts (fluorescent mini tufts, cryogenic suitability). Other methods are smoke wire techniques, vapor screens, and optical methods. E.A.K.

N82-32666*# Douglas Aircraft Co., Inc., Long Beach, Calif.
THE NEED FOR AN OPTICAL TRANSITION DETECTION SYSTEM IN THE NTF
M. F. Fancher *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 27-30 refs (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

Methods for transition detection were studied. The very high test and model costs necessitate testing of any new configuration over a range of Reynolds numbers for correlation with data obtained in conventional tunnels. The Reynolds number variations will be carried out at constant dynamic pressure, i.e., constant aeroelastic condition, by varying test temperature. Boundary layer transition cannot be expected to occur at the full scale location at significantly less than full-scale Reynolds numbers, and transition patterns will change with varying Reynolds number. Knowledge of the location of transition on model surfaces is essential for correct interpretation of drag data. The importance of transition, the limitations of artificial transition fixing, and their relation to the NTF are reviewed. The calculated minimum roughness height to instantaneously trip transition on a model transport wing over a range of Reynolds numbers of interest is shown in the NTF. E.A.K.

N82-32667*# Boeing Co., Seattle, Wash. Aerodynamic Lab.
SURFACE FLOW VISUALIZATION REQUIREMENTS FOR TESTING IN NTF
Ronald L. Bengelink *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 31-35 refs (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

Surface flow visualization is required to be correlated at all the facilities to allow the following: (1) an understanding of the chordwise and spanwise extent of laminar flow; (2) the change in shock location for various trip configurations; (3) the effectiveness of the chosen boundary layer trip (since its specifications will change as a function of Reynolds number); and (4) a comparison of the separation patterns at the buffet conditions. A requirement to tunnel-to-tunnel correlation testing involving the NTF is pointed out. A specification for a surface flow visualization system to be used in the NTF is defined. Recognition of the special limitations in the NTF including physical and visual accessibility, high operating cost, flow contamination requirements, as well as the need for on-line review of the results to develop the final trip configurations in a timely manner, leads to the listed requirements. E.A.K.

N82-32668*# Boeing Co., Seattle, Wash. Aerodynamic Lab.
SURFACE FLOW VISUALIZATION USING INDICATORS
James P. Crowder *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 37-46 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

Surface flow visualization using indicators in the cryogenic wind tunnel which requires a fresh look at materials and procedures to accommodate the new test conditions is described. Potential liquid and gaseous indicators are identified. The particular materials illustrate the various requirements an indicator must fulfill. The indicator must respond properly to the flow phenomenon of interest and must be observable. Boundary layer transition is the most important phenomenon for which flow visualization indicators may be employed. The visibility of a particular indicator depends on utilizing various optical or chemical reactions. Gaseous indicators are more difficult to utilize, but because of their diversity may present unusual and useful opportunities. Factors to be considered in selecting an indicator include handling safety, toxicity, potential for contamination of the tunnel, and cost. E.A.K.

N82-32669*# Maryland Univ., College Park. Dept. of Aerospace Engineering.
A COLOR VIDEO DISPLAY TECHNIQUE FOR FLOW FIELD SURVEYS
Allen E. Winkelmann and Chen P. Tsao *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 47-58 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

Color video display techniques for flow field surveys are presented. The following techniques were examined: traverse device, used for flow field surveys above and behind finite wing models; flow chart of data reduction for color video display technique; location of spanwise survey stations above and behind wing; hot wire data at first three survey stations on fully stalled wing; hot wire data at last three stations behind fully stalled wing; hot wire and pitch probe data; magnitude of velocity, yaw angle, pitch angle, and cross flow direction from 5 tube survey at X/C = 2.70 behind fully stalled wing. E.A.K.

N82-32670*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NEW VERSIONS OF OLD FLOW VISUALIZATION SYSTEMS
Walton L. Howes *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 59-64 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

A small, modified Mach-Zehnder interferometer placed in series with a much larger schlieren optical system spanning the test section is examined. In one arm of the interferometer, light from the schlieren is focused through a pinhole and recollimating lens to produce a reference beam which interferes with the remaining object beam from the other arm. The object and reference beams are separated only over a small interval following the test section, and differential vibrations are greatly reduced. Color schlieren has technical, as well as aesthetic, advantages over black-and-white schlieren. Since each color is associated with a specific amount of refraction, quantitative evaluation of certain refractive-index fields becomes possible using very simple equations derived from ray trace theory. Rainbow schlieren of an acetylene flame, and the evaluated refractive index distribution are shown. Root-mean-square refractive index fluctuations in homogeneous, isotropic turbulence were determined using the rainbow schlieren, since these fluctuations determine the root-mean-square refraction, which is indicated by the overall color of the image. E.A.K.

N82-32671*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
OPERATIONAL FLOW VISUALIZATION TECHNIQUES IN THE LANGLEY UNITARY PLAN WIND TUNNEL
William A. Corlett *In its* Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 65-73 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

The unitary plan wind tunnel (UPWT) uses in daily operation are shown. New ideas for improving the quality of established flow visualization methods are developed and programs on promising new flow visualization techniques are pursued. The unitary plan wind tunnel is a supersonic facility, referred to as a production facility, although the majority of tests are inhouse basic research investigations. The facility has two 4 ft. by 4 ft. test sections which span a Mach range from 1.5 to 4.6. The cost of operation is about $10 per minute. Problems are the time required for a flow visualization test setup and investigation costs and the ability to obtain consistently repeatable results. Examples of sublimation, vapor screen, oil flow, minitufts, schlieren, and

shadowgraphs taken in UPWT are presented. All tests in UPWT employ one or more of the flow visualization techniques. E.A.K.

N82-32672*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROPELLER FLOW VISUALIZATION TECHNIQUES
George L. Stefko, F. J. Paulovich, J. P. Greissing, and E. D. Walker *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 75-89 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

Propeller flow visualization techniques were tested. The actual operating blade shape as it determines the actual propeller performance and noise was established. The ability to photographically determine the advanced propeller blade tip deflections, local flow field conditions, and gain insight into aeroelastic instability is demonstrated. The analytical prediction methods which are being developed can be compared with experimental data. These comparisons contribute to the verification of these improved methods and give improved capability for designing future advanced propellers with enhanced performance and noise characteristics. E.A.K.

N82-32673*# X-Aero Co., Mercer Island, Wash.
IN-FLIGHT PROPELLER FLOW VISUALIZATION USING FLUORESCENT MINITUFTS
James P. Crowder *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 91-95 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01

Extension of fluorescent minituft method to in-flight flow visualization on propellers is described. Extremely thin nylon monofilament for the minitufts, is used in a process of attaching them to the test surface with small drops of lacquer-like adhesive, and the use of fluorescence photography for recording the minituft patterns. Using this method, thousands of minitufts can be applied to small, high speed wind tunnel models without affecting the airflow. The minitufts can remain in place throughout a wind tunnel test, permitting nonintrusive flow visualization data to be acquired at any time. E.A.K.

N82-32674*# Aircraft Research Association Ltd., Bedford (England).
SHADOWGRAPH TECHNIQUES IN TRANSONIC TESTS WITH POWERED NACELLES
P. G. Hutton *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 97-100 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

Shadowgraph photography techniques in transonic wind tunnel tests are described. The system was used in tests with powered nacelle rings to visualize the shock wave pattern in the exhaust flow. The technique is also used for installed nacelle tests on a floor mounted half model with a turbine powered fan engine simulator. E.A.K.

N82-32675*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLOW VISUALIZATION OF SHOCK-BOUNDARY LAYER INTERACTION
Warren R. Hingst and Mark Jurkovich *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 101-108 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

Two and three-dimensional shock-boundary layer interaction data were obtained from supersonic wind tunnel tests. These interactions are studied both with and without boundary layer bleed. The data verify computational fluid dynamic codes. Surface static pressure, pitot pressure, flow angularity, and bleed rates, are studied by flow visualization techniques. Surface oil flow using fluorescent dye and laser sheet using water droplets as the scattering material are used for flow visualization. E.A.K.

N82-32676*# Boeing Co., Seattle, Wash. Aerodynamic Lab.
TRANSONIC APPLICATIONS OF THE WAKE IMAGING SYSTEM
James P. Crowder *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 109-115 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

The extension of a rapid flow field survey method (wake imaging system) originally developed for low speed wind tunnel operation, to transonic wind tunnel applications is discussed. The advantage of the system, beside the simplicity and low cost of the data acquisition system, is that the probe position data are recorded as an optical image of the actual sensor and thus are unaffected by the inevitable deflections of the probe support. This permits traversing systems which are deliberately flexible and have unusual motions. Two transverse drive systems are described and several typical data images are given. M.G.

N82-32677*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLOW VISUALIZATION IN THE LANGLEY 0.3-METER TRANSONIC CRYOGENIC TUNNEL AND PRELIMINARY PLANS FOR THE NATIONAL TRANSONIC FACILITY
D. B. Rhodes and S. B. Jones *In its* Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 117-132 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

Design problems associated with the integration of flow visualization in cryogenic facilities are discussed. The possible effects from the cryogenic environment (i.e., window distortion due to thermal contraction both in the mounts and in the window material itself and turbulence in the flow due to injected LN2) are examined. The flow visualization techniques studied are schlieren, shadowgraph, moire deflectometry, and holographic interferometry. The test beds for this work are a Langley in-house cryogenic test chamber and the 0.3-Meter Transonic Cryogenic Tunnel. M.G.

N82-32678*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SEEING THROUGH FLOWS IN LANGLEY'S 0.3-METER TRANSONIC CRYOGENIC TUNNEL
W. L. Snow, A. W. Burner, and W. K. Goad *In its* Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 133-147 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

Viewing problems associated with the measurement of model deformation in cryogenic wind tunnels are discussed. Tests were conducted in the Langley 0.3-Meter Transonic Cryogenic Tunnel to assess viewing capabilities thru the flow field. The effects of condensation and turbulent boundary layers are discussed and a modelling procedure for image degradation is described. M.G.

N82-32679*# Spectron Development Labs, Inc., Tullahoma, Tenn.
HOLOGRAPHIC FLOW VISUALIZATION: STATE-OF-THE-ART OVERVIEW
J. D. Trolinger *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 149-158 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

Components and system designs of holographic flow visualization techniques are reviewed. Recording materials, lasers, and data processing and display are discussed. M.G.

N82-32680*# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering and Applied Mechanics.
MEASUREMENT OF THREE-DIMENSIONAL DENSITY DISTRIBUTION BY HOLOGRAPHIC INTERFEROMETRY AND COMPUTER TOMOGRAPHY
Charles M. Vest *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 159-174 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

The use of holographic interferometry to measure two and

three-dimensional flows and the interpretation of multiple-view interferograms with computer tomography are discussed. Computational techniques developed for tomography are reviewed. Current research topics are outlined including the development of an automated fringe readout system, optimum reconstruction procedures for when an opaque test model is present in the field, and interferometry and tomography with strongly refracting fields and shocks. M.G.

N82-32681*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

HOLOGRAPHIC INTERFEROMETRY AND TOMOGRAPHY AT AMES RESEARCH CENTER

George Lee *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 179-191 (For primary document see N82-32663 23-35)

Avail: NTIS HC A16/MF A01 CSCL 14B

A YAG laser holographic interferometer system and reconstruction laboratory for the Ames 2- by 2-Foot Transonic Wind Tunnel are discussed. This system provides dual plate and double pulse holography for quantitative and qualitative measurements, respectively. Interferometric measurements of two-dimensional airfoils and three-dimensional bodies of revolution for a tomography feasibility study were made. The two-dimensional work included supercritical airfoils, an oscillating airfoil undergoing dynamic stall, and a circulation control airfoil. The tomography experiments centered around hemispherical nose and tangent ogive models. In addition, the tomography work covered the development of a Fourier transform code for the retrieval of the three dimensional density distributions from the interferograms. M.G.

N82-32682*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

FLOW FIELD STUDIES USING HOLOGRAPHIC INTERFEROMETRY AT LANGLEY

A. W. Burner, W. L. Snow, William K. Goad, V. T. Helms, and P. B. Gooderum *In its* Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 193-204 (For primary document see N82-32663 23-35)

Avail: NTIS HC A16/MF A01 CSCL 14B

Some of the uses of holographic interferometry at Langley Research Center both for flow visualization and for density field determinations are described and tests in cryogenic flows at the Langley 0.3-Meter Transonic Cryogenic Tunnel are discussed. Experimental and theoretical fringe shift data are compared. M.G.

N82-32683*# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.

LASER VELOCIMETRY: A STATE-OF-THE-ART OVERVIEW

Warren H. Stevenson *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 205-214 refs (For primary document see N82-32663 23-35)

Avail: NTIS HC A16/MF A01 CSCL 14B

General systems design and optical and signal processing requirements for laser velocimetric measurement of flows are reviewed. Bias errors which occur in measurements using burst (counter) processors are discussed and particle seeding requirements are suggested. M.G.

N82-32684*# Colorado State Univ., Fort Collins. Dept. of Physics.

COHERENT RAMAN SPECTROSCOPIES FOR MEASURING MOLECULAR FLOW VELOCITY

C. Y. She *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 215-217 (For primary document see N82-32663 23-35)

Avail: NTIS HC A16/MF A01 CSCL 14B

Various types of coherent Raman spectroscopy are characterized and their application to molecular flow velocity and direction measurement and species concentration and temperature determination is discussed. M.G.

N82-32685*# Illinois Univ., Urbana-Champaign. Dept. of Theoretical and Applied Mechanics.

MEASUREMENT POTENTIAL OF LASER SPECKLE VELOCIMETRY

Ronald J. Adrian *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 219-226 (For primary document see N82-32663 23-35)

Avail: NTIS HC A16/MF A01 CSCL 14B

Laser speckle velocimetry, the measurement of fluid velocity by measuring the translation of speckle pattern or individual particles that are moving with the fluid, is described. The measurement is accomplished by illuminating the fluid with consecutive pulses of Laser Light and recording the images of the particles or the speckles on a double exposed photographic plate. The plate contains flow information throughout the image plane so that a single double exposure may provide data at hundreds or thousands of points in the illuminated region of the fluid. Conventional interrogation of the specklegram involves illuminating the plate to form Young's fringes, whose spacing is inversely proportional to the speckle separation. Subsequently the fringes are digitized and analyzed in a computer to determine their frequency and orientation, yielding the velocity magnitude and orientation. The Young's fringe technique is equivalent to performing a 2-D spatial correlation of the double exposed specklegram intensity pattern, and this observation suggests that correlation should be considered as an alternative processing method. The principle of the correlation technique is examined. M.G.

N82-32686*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STATUS OF LASER ANEMOMETRY IN TURBOMACHINERY RESEARCH AT THE LEWIS RESEARCH CENTER

Richard G. Seasholtz *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 227-234 refs (For primary document see N82-32663 23-35)

Avail: NTIS HC A16/MF A01 CSCL 14B

Laser anemometer systems were developed for a full-annular turbine stator cascade facility and for a compressor rotor facility; both are ambient temperature axial flow facilities with a 20-inch tip diameter. The optical configurations of the two anemometers are similar single-component fringe-type backscatter systems with a probe volume diameter of 125 microns and length of about 2 mm. Laser anemometer measurements are compared with numerical solutions for a transonic axial flow compressor rotor and a turbine stator cascade. M.G.

N82-32687*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany). Inst. for Experimental Fluid Dynamics.

FLOW VISUALIZATION EFFORTS AND PILOT MEASUREMENTS WITH A LASER-DOPPLER ANEMOMETER IN BACKSCATTER MODE

K. A. Buetefisch *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 235-241 refs (For primary document see N82-32663 23-35)

Avail: NTIS HC A16/MF A01 CSCL 14B

Activities involving the use flow visualization and laser anemometers are reviewed. In particular, turbulent pipe flow measurements and local velocity determination in a 3 X 3 sq meter wind tunnel are discussed. The calibration of laser anemometer systems using a rotating disk is also addressed. M.G.

N82-32688*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DEVELOPMENT OF A LASER VELOCIMETER FOR A LARGE TRANSONIC WIND TUNNEL

John P. Greissing and Daniel L. Whipple *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 243-247 (For primary document see N82-32663 23-35)

Avail: NTIS HC A16/MF A01 CSCL 14B

On a 8 x 6 Foot Supersonic Wind Tunnel a laser velocimeter was utilized in the testing of advanced high speed turbopropellers.

The system, using a 15-W argon-ion laser, a 3-beam 2-axis transmitting-receiving optics package, a zoom lens with 1- to 4-m focal lengths, and a 0.4-m corner mirror was initially assembled and tested in the checkout room. During the time the system was located in the checkout area, experience was acquired in the alignment and operation of the system and the data acquisition system and software were developed. By using air jets to simulate tunnel air flow, the system worked quite well. However, problems with beam alignment arose because of reduced atmospheric pressure. Mounting the laser into a vessel maintained at atmospheric pressure with deflectors mounted to the external walls improved operation for about 2 hours before misalignment reoccured. The system was remounted to the positioning platform in an enclosure that provides both thermal and acoustic isolation. R.J.F.

N82-32689*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SEEDING CONSIDERATIONS FOR AN LV SYSTEM IN A LARGE TRANSONIC WIND TUNNEL
Robert J. Freedman *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 249-252 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

When it was decided to use a laser velocimeter to measure the properties of propellers, seeding was a great concern since large particles fail to flow and small ones are too small to be seen. Many methods were tried and weeded out by using a Malvern particle sizer. The most promising ones were tested in the tunnel and the laser velocimeter (LV) measurements compared to theoretical values of veocity as the particle approached a blunt nose body along a stagnation streamline. Data obtained from the LV system were compared with the one dimensional particle lag calculation. This figure showed the theoretical velocity over the blunt nose and a velocity profile for 5 um particles. This indicated the particles were approximately 5 um. The seeding method is shown. The seed was atomized by 2 seeders run with all 12 available atomizer jets on. The atomizer seed traveled from these two seeders through four 1 inch tubes 20 feet long to the plenum chamber where this cluster of tubes injected the seed into the air stream. The tubes were located 60 feet from the model and could be moved only by shutting the tunnel down. Future seeding plans are shown. R.J.F.

N82-32690*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LV MEASUREMENTS WITH AN ADVANCED TURBOPROP
Harvey E. Neumann and J. S. Serafini *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 253-256 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

Nonintrusive measurements of velocity about a spinner-propeller-nacelle configuration were made at a Mach number of 0.8. A laser velocimeter (LV) specifically developed for these measurements was used to determine the flow field of the advanced swept SR-3 propeller. The data will be used to study the flow and to verify computer prediction codes. The usefulness of the LV data in detecting flow anomalies and to substantiate the data quality was demonstrated. Some typical results are given. Mach number profiles at the entrance of the propeller are compared with theoretical predictions. The LV data is in excellent agreement with the axisymmetric, compressible, inviscid theory (without blades) ahead of the propeller except near the hub. The data indicate blade blockage near the spinner. Blade to blade variations in axial velocity for four radial positions at the propeller exist are also given. The large apparent wake near the hub is associated with the hub choking. The blade to blade variation of axial velocity ahead of a shock within the blade passage is given. R.J.F.

N82-32691*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE 16-FOOT TRANSONIC TUNNEL LASER VELOCIMETER SYSTEM
J. M. Franke *In its* Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 257-272 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

The Langley 16-foot transonic wind tunnel is described. The system configuration, optical layout, laser color separator, optical receiver, and tunnel window are discussed. R.J.F.

N82-32692*# Lockheed-Georgia Co., Marietta.
LASER VELOCIMETER APPLICATIONS TO HIGH-LIFT RESEARCH
Robert R. Whipkey, Greg Jones, and John A. Braden *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 273-281 ref (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

The application of the Lockheed-Georgia 2-D laser velocimeter (LV) burst-counter system to the flow field around a 2- and 3-element high-lift airfoil is discussed. The characteristic behavior of the confluent boundary layer (that is, the boundary layer existing downstream of a slot as it approaches and undergoes separation is evaluated. In this application, the LV represents all ideal instruments for nonintrusively probing into the narrow slots and cove areas characterizing mechanical high-lift systems. The work is being performed in the Lockheed-Georgia 10 x 30-inch low-speed test facility using a 9-inch (basic) chord section of the general aviation GAW-1 airfoil. The LV system employs a 4-W argon laser and operates in an off-axis, backscatter mode with a focus length of about 30 inches. Smoke is used as the seeding medium and is injected downstream of the model such that particle uniformity and size are constant upon completion of the tunnel circuit into the test area. The LV system is fully automated by utilizing a MAC-16 minicomputer for positioning, data acquisition, and preliminary data reduction. R.J.F.

N82-32693*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPLICATIONS OF A LASER VELOCIMETER IN THE LANGLEY 4- BY 7-METER TUNNEL
William L. Sellers and Joe W. Elliott (Army Structures Lab.) *In its* Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 283-293 refs (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

Applications of a laser velocimeter in the Langley 4 by 7 meter wind tunnel are discussed. The system configuration is described. The data acquisition, the laser velocimeter traversing, and the particle generating systems are discussed. Flow distribution and rotor wake applications are discussed. R.J.F.

N82-32694*# Naval Surface Weapons Center, White Oak, Md. Aerodynamics Branch.
APPLICATION OF THE LASER DOPPLER VELOCIMETER IN AERODYNAMIC FLOWS
William J. Yanta and Donald W. Ausherman *In* NASA. Langley Research Center Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 295-302 ref (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

Applications of the laser Doppler velocimeter (LDV) are discussed. Measurements were made of the flowfield around a tangent-ogive model in a low turbulent, incompressible flow at an incidence of 45 deg. The free-stream velocity was 80 ft per second. The flowfield velocities in several cross-flow planes were measured with a 2-D, two-color LDC operated in a backscatter mode. Measurements were concentrated in the secondary separation region. A typical survey is given. The survey was taken at a model location where the maximum side force occurs. The overall character of the leeward flowfield with the influence of the two body vorticles are shown. Measurements of the velocity and density flowfields in the shock-layer region of a reentry-vehicle indented nose configuration were carried out at Mach 5. The velocity

flowfield was measured with a 2-color, 2-D, forward-scatter LDV system. Because of the need to minimize particle lag in the shock-layer region, polystyrene particles with a mean diameter of 0.312 microns were used for the scattering particles. The model diameter was 6 inches. R.J.F.

N82-32695*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPARISON OF HOT WIRE/LASER VELOCIMETER TURBULENCE INTENSITY MEASUREMENTS
Jim F. Meyers and S. P. Wilkinson *In its* Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 303-322 refs (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

The question of whether a random measure of particle velocities yields a good statistical estimate of the stationary condition of the turbulence flow field was investigated by comparing hot-wire and laser velocimeter turbulence intensity measurements. Great care was taken to insure that the instrument precision of both the laser velocimeter and hot wire was maximized. In this attempt to reduce the measurement uncertainties in the hot wire, direct digitization of the analog output signal was performed with point-by-point conversion to velocity through a spline fit calibration curve and the turbulence intensity function was calculated statistically. Frequent calibrations of the hot wire were performed using the laser velocimeter as the velocity standard to account for the presence of the small seed particles in the air flow and signal drift in the hot wire. R.J.F.

N82-32696*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LASER DOPPLER VELOCIMETRY APPLICATION IN THE LANGLEY 0.3-METER TRANSONIC CRYOGENIC TUNNEL
Luther R. Gartrell *In its* Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 323-334 refs (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

The problems and the potential use of a nonintrusive flow velocity measuring technique in the Langley 0.3 meter, transonic cryogenic tunnel (TCT) were investigated. A laser velocimeter (LV) was used. It was concluded that free-stream velocity measurements can be successfully made in the Langley 0.3-m TCT using a low-power (15-mW) LV system. The measured and calculated mean velocities typically agreed within one percent. The overall normalized standard deviation was less than one percent. Tunnel vibration and temperature had no detrimental effects on the optical system. It is recommended that the LV work should be further investigated for future use in the Langley 0.3-m TCT. R.J.F.

N82-32697*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
VELOCITY AND FLOW ANGLE MEASUREMENTS IN THE LANGLEY 0.3-METER TRANSONIC CRYOGENIC TUNNEL USING A LASER TRANSIT ANEMOMETER
W. C. Honaker *In its* Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 335-342 (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

The Laser Transit Anemometer (LTA) system is described. In the LTA system two parallel laser beams of known separation and cross sectional area are focussed at the same location or plane. When a particle in a flow field passes through both beams and the time is recorded for its transit (time of flight), its velocity can be calculated knowing the distance between the beams. By rotating the two beams (spots) around a common center and recording the number of valid events (a particle which passes through both spots in the proper sequence) at each angle the flow angle can be determined by curve fitting a predetermined number of angles or points and calculating the peak of what should be a Gaussian curve. The best angle or flow angle is defined as the angle at which the maximum number of valid events occurs. The LTA system functioned properly although conditions were less than desirable. R.J.F.

N82-32698*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOME NTF LASER VELOCIMETER INSTALLATION AND OPERATION CONSIDERATIONS
W. W. Hunter, Jr., L. R. Gartrell, and W. C. Honaker *In its* Flow Visualization and Laser Velocimetry for Wind Tunnels Sep. 1982 p 343-358 refs (For primary document see N82-32663 23-35)
Avail: NTIS HC A16/MF A01 CSCL 14B

Two velocimeter techniques were considered as potential candidates for achieving the flow field angularity measurements. The first was the fringe laser Doppler velocimeter, (LDV). A great deal of experience was obtained with this approach at Langley and the literature is rich with papers describing many experimental applications and system performance details. That is, many velocity flow field measurements were conducted with the LDV but not with high resolution precise angularity measurements. The second candidate considered was the two-spot laser transit anemometer, (LTA). This approach was not as extensively used as the LDV technique, but literature does contain experimental applications and system performance details. Again, a lack of high resolution, high precision angularity measurements is noted for the LTA. The results of the study suggessed that the LDV and LTA tests and other efforts did not reveal any fundamental problems that would suggest that laser velocimetry is not a viable diagnostic technique for the National Transonic Facility. However, there are a number of engineering problems that need to be solved. R.J.F.

N82-32699*# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
RESONANT DOPPLER VELOCIMETRY IN SUPERSONIC NITROGEN FLOW Ph.D. Thesis. Final Report, 31 Oct. 1979 - 31 Jul. 1982
Shi-wai S. Cheng 31 Jul. 1982 187 p refs
(NASA-CR-169330; NAS 1.26:169330; MAE-T-1574) Avail: NTIS HC A09/MF A01 CSCL 14B

The development of the Resonant Doppler Velocimeter (RDV) is discussed. It is a new nonintrusive laser technique for flow diagnosis. The RDV technique is applied to supersonic nitrogen flow with sodium atoms as tracer particles. The measurements are achieved by shining a tunable single frequency laser beam into the flow. The resonant absorption spectrum of the seeded species is determined by observing the fluorescence signal intensity as a function of excitation wavelength. By comparing the peak absorption wavelength with a reference frequency marker, the flow velocity along the excitation beam can be obtained through the Doppler shift relation. By fitting the spectrum with a theoretical line profile, the static temperature and pressure of the flow an be determined. B.W.

N82-32700*# Santa Barbara Research Center, Goleta, Calif.
VISIBLE INFRARED SPIN-SCAN RADIOMETERS (VISSR) FOR THE GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE (GOES) B AND C APPLICATION Final Report, 31 Aug. I974
1 Jul. 1977 175 p
(Contract NAS5-20660)
(NASA-CR-170434; NAS 1.26:170434) Avail: NTIS HC A08/MF A01 CSCL 14B

Two visible infrared spin scan radiometer (VISSR) instruments provided for the Geostationary Operational Environmental Satellite B and C (GOES B and C) spacecrafts are described. The instruments are identical to those supplied previously are summarized. A significant number of changes primarily involving corrections of drawing errors and omissions were also performed. All electrical changes were breadboarded (where complexity required this), were incorporated into the test module, and subjected to verification of proper operation throughout fall instrument temperature range. Evaluation of the changes also included design operating safety margins to account for component variations and life. J.D.

N82-32701# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ANALYSIS AND DESIGN OF A DIGITAL CONTROLLER FOR A

SEISMICALLY STABLE PLATFORM M.S. Thesis
Stanley W. Francis Dec. 1981 319 p refs
(AD-A115559; AFIT/GE/EE/81D-22) Avail: NTIS HC A14/MF A01 CSCL 17/7

The Seismically Stable Platform (SSP) at the Central Inertial Guidance Facility, Holloman AFB, is a dual reactionary mass isolation platform designed to remove 10 to the minus eighth g RMS/Hz accelerations and 0.02 arcseconds angular position or tilt disturbances in all axes from a test environment intended for evaluating Third Generation Gyro inertial instruments. Disturbances are removed by two stages of pneumatic isolators comprising a passive isolation system and augmented by an active control system to cover the operational bandwidth from 10 to the minus eighth Hz to 100 Hz. A dynamic model of the SSP confirmed the passive vibration transmissibilities and identified severe limitations on gain and phase margin to the active controller design. The proposed digital controllers identified the SSP to be weakly controllable. The discrete state representation of the SSP and control law exhibited numerical difficulties detrimental to system stability. Single stage pneumatic isolation or fluid isolators monitored by disturbance parameter estimation schemes are recommended.
Author

N82-32702# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Industrial Engineering and Operations Research.
QUALITY METRICS OF DIGITALLY DERIVED IMAGERY AND THEIR RELATION TO INTERPRETER PERFORMANCE. PART 3: SUBJECTIVE SCALING OF HARD-COPY DIGITAL IMAGERY Final Report, 1 Oct. 1979 - 30 Sep. 1980
Harry L. Snyder, David I. Shedivy, and Michael E. Maddox Feb. 1982 81 p refs
(Contract F49620-80-C-0057; AF Proj. 2313)
(AD-A115948; VPI-HFL-81-3; AFOSR-82-0475TR) Avail: NTIS HC A05/MF A01 CSCL 14/5

Hard-copy digital imagery was studied with respect to subjective image quality. Trained Air Force photointerpreters judged the interpretability of 250 military scenes. The scenes varied in noise, blur, and scene content. The results showed that noise, blur, and scene content produce differential perceptions of interpretability. Many interactions were significant. Other analyses performed on the data showed that at least 62 categories should be used to scale interpretability, the correlation between information extraction performance and scale values for digital imagery is high, and multidimensional scaling can be used with limited utility in studying image quality. In general, from a review of the literature, digital imagery did not appear to be greatly different from standard analog imagery in terms of subjective quality or interpretability.
Author (GRA)

N82-32703# AMAF Industries, Columbia, Md.
MAGNETIC FIELD COUPLED VELOCIMETERS - YEAR ONE Final Report, 15 Nov. 1980 - 14 Nov. 1981
Carl Spight 31 Jan. 1981 56 p
(Contract F49620-81-C-0004; AF Proj. 2308)
(AD-A115933; AFOSR-82-0501TR; Rept-8202-X4200-201) Avail: NTIS HC A04/MF A01 CSCL 20/3

The major elements of the theoretical analysis and numerical simulation phase of a multi-year research program to demonstrate the viability of a totally nonintrusive, magnetically coupled velocimeter has been completed. The velocimeter R/D program was undertaken to yield a device capable of accurately measuring the mean and the turbulent velocity structure of flow-fields typical of rocket combustion chambers and exhaust nozzles. A drive dipole magnetic field array was designed to produce a harmonically varying, spatially localized and controlled field which penetrates flow-fields to produce eddy and motional currents. A probe array has been designed to differentiate those currents from each other and the drive array currents by analytically inverting the measured fields to yield the spatial structure of flow velocity and conductivity. An experimental test of the basic approach (using a electrolytic test chamber) has verified key elements in the analysis. A small, bench scale combustor test of the approach has begun.
Author (GRA)

N82-32704# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DISTRIBUTED SENSOR NETWORKS Semiannual Technical Summary Report, 1 Apr. - 30 Sep. 1981
Richard T. Lacoss 3 Sep. 1981 42 p refs
(Contract F19628-80-C-0002; ARPA Order 3345)
(AD-A115729; ESD-TR-82-012) Avail: NTIS HC A03/MF A01 CSCL 17/1

The Distributed Sensor Networks (DSN) program is aimed at developing and extending target surveillance and tracking technology in systems that employ multiple spatially distributed sensors and processing resources. Such a system would be made up of sensors, data bases, and processors distributed throughout an area and interconnected by an appropriate digital-data communication system. Surveillance and tracking of low-flying aircraft has been selected to develop and evaluate DSN concepts in the light of a specific system problem. A DSN test bed that will make use of multiple small acoustic arrays as sensors for low-flying aircraft is being developed and will be used to test and demonstrate DSN techniques and technology.
GRA

N82-32705# Institut de Recherche de l'Hydro-Ontario.
SOIL THERMAL RESISTIVITY AND THERMAL STABILITY MEASURING INSTRUMENT. VOLUME 2: MANUAL FOR OPERATION AND USE OF THE THERMAL PROPERTY ANALYZER AND STATISTICAL WEATHER ANALYSIS PROGRAM TO DETERMINE THERMAL DESIGN PARAMETERS Final Report
S. A. Boggs, H. S. Radhakrishna, F. Y. Chu, G. L. Ford, J. D. A. Griffin, and J. Steinmanis Nov. 1981 75 p refs Sponsored by EPRI
(EPRI Proj. 7861)
(DE82-901899; EPRI-EL-2128-Vol-2) Avail: NTIS HC A04/MF A01

Numerous considerations influence the thermal design of an underground power cable, including the soil thermal resistivity, thermal diffusivity and thermal stability. Each of these properties is a function of soil moisture which is in turn a function of past weather, soil composition, and biological burden. The Neher-McGrath formalism has been widely used for thermal cable design. However, this formalism assumes knowledge of soil thermal properties (resistivity and diffusivity). For design purposes, these parameters should be treated statistically, since weather varies greatly from year to year. As well, soil thermal property surveys are normally required along the route to assess the thermal quality of the native soil. This project is intended to fill the gap between the need to carry out thermal design and the use of the Neher-McGrath formalism which is normally employed. This goal has been addressed through: development of instrumentation and methods of measuring soil thermal properties in situ and in the laboratory; recommendation of methods for conducting soil surveys along a proposed cable route and of assessing the thermal quality of soils; and development of a computerized method to treat soil thermal design parameters on a statistical basis using computerized weather records as supplied by the US Environmental Data Service. The use of the methods and instrumentation developed as a result of this contract should permit less conservative thermal design thereby improving the economics of underground transmission. As well, these techniques and instrumentation facilitate weather-dependent prediction of cable ampacity for installed cables, monitoring of backfill thermal stability, and many other new practices.
DOE

N82-32706# York Coll., Jamaica, N. Y.
SCINTILLATING OPTICAL FIBERS FOR FINE-GRAINED HODOSCOPES
S. R. Borenstein and R. C. Strand (Brookhaven National Lab., Upton, N.Y.) 1981 8 p refs Presented at the IEEE Symp. on Nucl. Sci., San Francisco, 21-23 Oct. 1981
(Contracts DE-AC02-76CH-00016; DE-AC02-81ER-40035)
(DE82-002859; BNL-30248; CONF-811012-32) Avail: NTIS HC A02/MF A01

Fast detectors with fine spatial resolution will be needed to exploit high event rates at ISABELLE. Scintillating optical fibers

for fine grained hodoscopes were developed. A commercial manufacturer of optical fibers has drawn and clad PVT scintillator. Detection efficiencies greater than 99% have been achieved for a 1 mm fiber with a PMT over lengths up to 60 cm. Small diameter PMT's and avalanche photodiodes have been tested with the fibers. Further improvements are sought for the fiber and for the APD's sensitivity and coupling efficiency with the fiber. DOE

N82-32707# National Radiological Protection Board, Chilton (England).
BERTHOLD CONTAMINATION METER TYPE LB1210B. INSTRUMENT EVALUATION NO. 23
P. H. Burgess and W. J. Iles Apr. 1981 18 p refs
(DE82-700873; NEPB-IE-23) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

This instrument is a well designed, well constructed contamination monitor that has unusual versatility. Where large surface areas require to be monitored it is particularly useful because of the large area of the detector. It is suitable for monitoring Alpha surface contamination of energy equal to and above that of 14C, for X- and low energy Beta-emitting nucleides. It has an adequate battery life, good temperature stability, comprehensive but simple controls, and a clear and accurate meter. A useful check source is provided. The only criticisms of the limitations of the alarm warning, the rather quiet click for each event detected, the rough surface finish, and the effects of high humidity. DOE

N82-32708# European Space Agency, Paris (France).
THE INFLUENCE OF GEOMETRIC PARAMETERS ON THE TRANSFER FUNCTION OF A PRESSURE TUBE WITH SPECIAL CONSIDERATION OF NONLINEARITIES
Karl Kienappel Feb. 1982 66 p refs Transl. into ENGLISH of "Der Einfluss geometrischer Parameter auf die Uebertragungsfunktion einer Druckmessleitung unter besonderer Berueckschichtigung von Nichtlinearitaeten" Rept. DFVLR-FB-80-27 DFVLR, Goettingen, West Germany, Jul. 1980 68 p
(ESA-TT-707; DFVLR-FB-80-27) Avail: NTIS HC A04/MF A01; original German version available from DFVLR, Cologne DM 16,30

The influence of various parameters such as tube length, change of diameter, tube shape, and tube material on the transfer function was investigated experimentally. In many cases there is a pronouncedly nonlinear behavior. A method is presented to estimate the transfer characteristics for such a nonlinear system. When unsteady pressures are measured on the end of a pressure tube instead of directly at the desired site, the pressure tube changes the unsteady signal. This characteristic is demonstrated to be frequency dependent. Pressure amplitude measurement results are used to determine real values for the transfer function. An empirical model of an estimated pressure control system is given. The possibility of approximating nonlinear pressure transfer from unsteady pressure measurement is shown. Author (ESA)

N82-32709# European Space Agency, Paris (France).
CONSTRUCTION AND PROPERTIES OF A QUADRUPOLE MASS SPECTROMETER SYSTEM DEVELOPED FOR RESEARCH ON THE ATMOSPHERE AND ITS INFLUENCE IN A THERMIONIC BARIUM-CESIUM MIXED VAPOR CONVERTER
Dieter Mahr Jun. 1982 110 p refs Transl. into ENGLISH of "Aufbau u. Eigenschaften eines Quadrupol-Massenspektrometer Systems, entwickelt zur Untersuchung der Atmosphaere u. ihres Einflusses in einem thermionischen Barium-Caesium-Mischdampfkonverter" Rept. DFVLR-FB-79-39 DFVLR, Stuttgart, Mar. 1979 109 p
(ESA-TT-701; DFVLR-FB-79-39) Avail: NTIS HC A06/MF A01; original German version available from DFVLR, Cologne DM 18,50

An apparatus for analyzing the atmosphere of thermionic barium-cesium mixed vapor converters is described. The converter power density dependent on the composition of the converter atmosphere is observed by means of measurements in which the converter characteristic is registered simultaneously with the analysis of the converter atmosphere. It is thus possible to define the composition of the converter atmosphere for which the maximum output is obtained. Author (ESA)

N82-32710# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
A SYSTEM FOR THE AUTOMATIC EVALUATION OF INTERFEROGRAMS
Friedhelm Becker 1982 115 p refs In GERMAN; ENGLISH summary
(MPIS-Mitt-74; ISSN-0374-1257) Avail: NTIS HC A06/MF A01

For the digitizing and processing of the interferograms from classical and holographic interferometers, a picture analysis system based upon a computer with a television digitizer was installed. Signal averaging, spatial smoothing, subtraction of the overlayed intensity function and the removal of distortion patterns using a spatial filtering technique in the frequency spectrum of the interferograms can be used. The extraction of fringe loci from the digitized interferograms is performed by a floating threshold method. The fringes are numbered using a special scheme after the removal of any fringe disconnections which appeared if there is not sufficient contrast in the holograms. The reconstruction of the object function from the fringe field is achieved by a local polynomial least squares approximation with spline fit. The averaging and subtraction of interferograms and the analysis of structures in the holographic interferograms of car tires as well as the evaluation of interferograms of transonic flows, are shown. Author (ESA)

N82-32711*# Scripps Institution of Oceanography, La Jolla, Calif. Visibility Lab.
THE CZCS GEOLOCATION ALGORITHMS
Wayne H. Wilson, Raymond C. Smith, and Jeffrey W. Nolten Oct. 1981 43 p
(Contract NAS5-26249; Grant NA80AA-D-00007)
(NASA-CR-169313; NAS1.26:169313; PB82-161183)
SIO-REF-81-32; NOAA-81121404) Avail: NTIS HC A03/MF A01 CSCL 14B

The Coastal Zone Color Scanner (CZCS) on board the Nimbus 7 satellite was designed to measure surface radiance upwelled from the ocean in 6 spectral bands. The CZCS spectrometer obtains its information from a rotating mirror and is timed to collect data when the mirror views the Earth surface between ca. 40 degrees to the left and right of the subsatellite track. Each scan is divided into 1968 picture elements, pixels, of 0.04 degrees scan each. In order to avoid direct reflected Sun glint, the rotating mirror shaft can be tilted so that scans across the subsatellite track up to 20 degrees forward or aft of the point directed beneath the satellite. The CZCS is the first satellite borne instrument to have this tilted scan capability and therefore poses some new problems in locating the Earth surface position of viewed pixels. GRA

N82-32530*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MONITOR AND CONTROL EQUIPMENT FOR THE MV-3 MOBILE VERY LONG BASELINE INTERFEROMETRY STATION
R. W. Sniffin *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 1-7 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 14B

36 LASERS AND MASERS

Includes parametric amplifiers.

N82-32712* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SCANNING AFOCAL LASER VELOCIMETER PROJECTION LENS SYSTEM Patent
David B. Rhodes, inventor (to NASA) Issued 31 Aug. 1982 4 p Filed 7 Sep. 1979 Supersedes N80-12866 (18 - 03, p 0393)
(NASA-Case-LAR-12328-1; US-Patent-4,346,990;

US-Patent-Appl-SN-073477; US-Patent-Class-356-28.5; US-Patent-Class-350-453) Avail: US Patent and Trademark Office CSCL 20E

A method and apparatus for projecting and focusing parallel laser light beams from a laser DOPPLER velocimeter on a target area are described. The system includes three lenses. Two lenses work together as a fixed afocal lens combination. The third lens is a movable scanning lens. Parallel laser beams travel from the velocimeter through the scanning lens and through the afocal lens combination and converge, i.e., are focused, somewhere beyond. Moving the scanning lens relative to the fixed afocal combination results in a scanning of the focus area along the afocal combination's optical axis.

Official Gazette of the U.S. Patent and Trademark Office

N82-32713*# Illinois Univ., Urbana. Radio Research Lab.
ATMOSPHERIC REFRACTION EFFECTS ON BASELINE ERROR IN SATELLITE LASER RANGING SYSTEMS
K. E. Im and C. S. Gardner Sep. 1982 63 p refs
(Grant NsG-5049)
(NASA-CR-169333; NAS 1.26:169333; RRL-Publ-519) Avail: NTIS HC A04/MF A01 CSCL 20E

Because of the mathematical complexities involved in exact analyses of baseline errors, it is not easy to isolate atmospheric refraction effects; however, by making certain simplifying assumptions about the ranging system geometry, relatively simple expressions can be derived which relate the baseline errors directly to the refraction errors. The results indicate that even in the absence of other errors, the baseline error for intercontinental baselines can be more than an order of magnitude larger than the refraction error. A.R.H.

N82-32714# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE H2O MASERS: SURVEY OF THE GALACTIC PLANE 2
M. A. Braz (Observatorio Nacional) and E. Scalise, Jr. Oct. 1981 23 p refs Submitted for publication Sponsored in part by FINEP
(INPE-2242-PRE/028) Avail: NTIS HC A02/MF A01

A search for H2O maser emission sources performanced towards radio continuum peaks of southern galactic HII regions is reported. Hydrogen oxide emission sources, type 1 and the ones for which the type is unknown, were also included in the survey. Sixteen sources displaying H2O maser emissions were found. Individual sources are discussed. S.L.

N82-32715# Vanderbilt Univ., Nashville, Tenn. Dept. of Chemistry.
SPECTROSCOPIC STUDIES OF LASING TRANSITIONS IN THE DIATOMIC MERCURY HALIDES Annual Summary Report, 1 May 1981 - 30 Apr. 1982
Joel Tellinghuisen Jun. 1982 20 p refs
(Contract N00014-81-K-0477)
(AD-A116297; N00014-81-K-0477-1; AR-1) Avail: NTIS HC A02/MF A01 CSCL 20/5

The B doublet Sigma(+) goes to X doublet Sigma(+) emission spectra of HgCl, HgBr, and HgI have been photographed and analyzed for the single isotopic species, Hg200 Cl35, Hg200Br79, Hg200I121 and Hg200I129. In every case the vibrational analysis corroborates Wieland's earlier work (1960) qualitatively but not quantitatively, in that the assignments deviate from his for high v' levels, leading to lower estimates of the dissociation energies of the ground states. In addition, the isotope effect for HgI indicates that Wieland's v' numbering should be decreased by one unit. Trial-and-error Franck-Condon calculations yield the following values for Delta R sub e (= R sub e' - R sub e') 0.60A(HgCl), 0.57A(HgBr), and 0.49A(HgI). These values are somewhat larger than reported previously, and they lead to significant changes in the Franck-Condon distributions for HgCl and HgBr. The reported laser "lines" in all three molecules occur in the region of strongest spontaneous emission. However, it seems that most of the laser features cannot be assigned to specific v'-v' bands. Rather, they appear to occur on a quasicontinuum of densely overlapped rotational lines of several v'-v" bands in the various isotopic HgX molecules present in "natural" HgX. GRA

N82-32716# Defence Research Establishment Valcartier (Quebec).
INVESTIGATION ON THE ABSORPTANCE OF STAINLESS STEEL TARGETS IRRADIATED BY A TEA-CO2 LASER
J.-P. Morency May 1982 24 p refs
(AD-A116662; DREV-R-4232/82) Avail: NTIS HC A02/MF A01 CSCL 11/6

A methodology has been developed to measure the absorptance (alpha) of metal targets irradiated by a TEA-CO2 laser. The approach allows dynamic measurements of the behavior of alpha when a laser beam is the sole heating source involved. Temperature-dependent thermophysical properties are considered in the reduction of the experimental data. It is shown that oxidation increases drastically the coupling of energy to the target above a threshold temperature which is a function of the type of material used and the environment into which the test is made.

Author (GRA)

N82-32717# Defense Intelligence Agency, Washington, D.C. Directorate for Scientific and Technical Intelligence.
BIBLIOGRAPHY OF SOVIET LASER DEVELOPMENTS, NUMBER 52, MARCH - APRIL 1981
17 May 1982 134 p
(AD-A116693; DST-2700Z-003-82) Avail: NTIS HC A07/MF A01 CSCL 20/5

Coverage includes basic research on solid state, liquid, gas, and chemical lasers; components, nonlinear optics, spectroscopy of laser materials; ultrashort pulse generation; crystal growing; theoretical aspects of advanced lasers; and general laser theory. Laser applications are listed under biological effects; communications; beam propagation; computer technology; holography; laser-induced chemical reactions; measurement of laser parameters; laser measurement application; laser-excited; optical effects; laser spectroscopy; beam-target interaction; and plasma generation and diagnostics. GRA

N82-32718# Watervliet Arsenal, N.Y. Product Assurance Directorate.
LASER INTERFEROMETER CALIBRATION STATION Final Report, Mar. 1978 - Sep. 1981
R. W. Campolmi and S. J. Krupski Oct. 1981 26 p refs
(AD-A116022; WVT-QA-8101) Avail: NTIS HC A03/MF A01 CSCL 20/5

The laser interferometer is a versatile tool, used for calibration over both long and short distances. It is considered traceable to the National Bureau of Standards. The system developed under this project was to be capable of providing for the calibration of many types of small linear measurement devices. The logistics of the original concept of one location for calibration of all mics, calipers, etc. at a large manufacturing facility proved unworkable. The equipment was instead used for the calibration of the large machines used to manufacture cannon tubes. Author (GRA)

N82-32719# Washington Univ., Seattle. Aerospace and Energetics Research Program.
RESEARCH ON THE FLOW PHENOMENA RELATED TO HIGH POWER LASER Final Technical Report, 1 Nov. 1978 - 31 Dec. 1981
W. H. Christiansen, D. A. Russell, and A. Hertzberg 31 Mar. 1982 25 p refs
(Contract F49620-79-C-0020; AF Proj. 2307)
(AD-A115944; AFOSR-82-0489TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

The fundamental mechanisms of the interaction of electrical discharges of the glow type and the fluid mechanics normally found in electric discharge lasers have been studied in an effort to improve their performance capability. Basic information on these devices was obtained via small-scale experiments at the University of Washington. An alternative method of phase compensation for laser beams using the refractive properties of gas jets

was also investigated. The amount of beam degradation produced by turbulent shear layers in the jets was studied also. The experimental investigation of this beam degradation mechanism constitutes much of the effort in the project. Theoretical calculations detailing the effects of mixing of dissimilar gases at low Mach number have been carried out. High-power laser mixing flows have been studied by numerical, analytical, and experimental techniques. The models for wave decay in supersonic cavity flows have been extended, optical sensitivities calculated, and experiments conducted using a laser interferometer. Calculated thermodynamic parameter history through decaying wave systems has been used with simple HF reaction models to study strongly-coupled reaction shocks. A systematic study of the sensitivity of HF laser performance to fluid process assumptions has been carried out, with emphasis on power extraction measurements from a versatile shock/Ludwieg tube laboratory laser. Author (GRA)

N82-32720# Arizona Univ., Tucson. Dept. of Electrical Engineering.
ELECTROSTATIC TECHNOLOGY FOR CONTROL OF DUST AND HYDROCARBON VAPORS IN HIGH POWER LASER SYSTEMS Final Report
Stuart A. Hoenig Kirtland AFB, N. Mex. AFWL Apr. 1982 62 p refs
(Contract F29601-80-C-0060)
(AD-A115618; AFWL-TR-81-135) Avail: NTIS HC A04/MF A01 CSCL 20/5

The application of electrostatic techniques has been investigated as a repulsion system to keep dust off mirrors that might be used in high-power laser systems. A demonstration unit for a 30 cm mirror was built and shipped to Kirtland Air Force Base as part of the program. Other efforts investigated the development of technology that might be used to keep dust and contaminants off large mirrors in an orbiting space platform. If there is dust deposition it may be practical to clean the reflecting surfaces with a dry wipe-off system without damaging delicate coatings or metal films. Author (GRA)

N82-32721# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Dept. of Electrical Engineering.
METHODS FOR AN ALTERNATING BEAM RING LASER M.S. Thesis
Marc L. Drake Dec. 1981 75 p refs
(AD-A115576; AFIT/GE/EE/81D-17) Avail: NTIS HC A04/MF A01 CSCL 20/5

The purpose of this research is to investigate the feasibility of three methods of alternating beams in ring lasers. The first method is the use of a Faraday cell and a half-wave plate inside the laser cavity to rotate the plane of polarization of one of the counter-rotating beams so that lasing in that direction is not supported. The second method, and the one investigated experimentally, is the use of mirrors and a mechanical chopper external to the laser cavity to halt lasing by means of mode competition. The third and final method explored is the replacement of the mechanical chopper with an electro-optical shutter. Author (GRA)

N82-32722# New Mexico Univ., Albuquerque.
ASPECTS OF HIGH-ENERGY LASER THEORY Final Report, 1 Sep. 1980 - 31 Oct. 1981
Marlan O. Scully and Mark Hillery 1981 44 p refs
(Grant AF-AFOSR-0278-80; AF Proj. 2301)
(AD-A115942; AFOSR-82-0474TR) Avail: NTIS HC A03/MF A01 CSCL 20/5

The research which was conducted under this contract fell mainly into three categories: gain switching, infection locking, and photon statistics. In addition, some work in the foundations of radiative transport theory and spectroscopy was also performed. The use of a metastable state as the upper laser level was shown to offer the possibility of obtaining large inversions and thereby storing large amounts of energy in the lasing medium. The problem associated with this is that the linear gain which one obtains from the transition from this level to the lower laser level is quite small. The possibility of 'dumping' the energy stored in the metastable was investigated. Author (GRA)

N82-32723# California Univ., Santa Barbara. Quantum Inst.
ELECTROSTATIC ACCELERATOR FREE ELECTRON LASERS
Luis R. Elias 28 Oct. 1981 18 p refs
(Contract N00014-80-C-0308)
(AD-A115939; QIFEL-004-80) Avail: NTIS HC A02/MF A01 CSCL 20/7

The amplification of short wavelength coherent electromagnetic radiation by relativistic electrons moving through a spatially periodic transverse magnetic field was first demonstrated at Stanford University. These experiments were carried out using the bunched electron beam emerging from a radio frequency linear accelerator. Although the electron beam quality was ideally suited to study the most important operating characteristics of the free electron laser, the small amount of available average electron beam current coupled with only a small laser extraction efficiency contributed to limit both the amount of average laser power produced ($P=0.5$ watts) and the overall operating efficiency of the device ($e<0.1\%$). Since the Stanford experiments a considerable amount of work has been done to study various schemes directed toward the development of efficient high power free electron lasers. In some of the schemes high single pass laser extraction efficiency is pursued using for example variable parameter wigglers, constant period wigglers consisting of only a few magnet periods and constant period gain-expanded wigglers. In other schemes the electron beam is recirculated several times through the laser interaction region increase total overall efficiency while retaining the characteristically small single pass efficiency of a constant period wiggler. GRA

N82-32724# California Univ., Santa Barbara. Quantum Inst.
THREE DIMENSIONAL RADIATION FIELDS IN FREE ELECTRON LASERS USING LIENARD-WIECHERT FIELDS
Luis R. Elias and Juan Gallardo 28 Oct. 1981 24 p refs Sponsored in part by AFOSR
(Contract N00014-80-C-0308)
(AD-A115938; QIFEL-012/81) Avail: NTIS HC A02/MF A01 CSCL 20/7

In a free electron laser a relativistic electron beam is bunched under the action of the ponderomotive potential and is forced to radiate in close phase with the input wave. Until recently, most theories of the FEL have dealt solely with electron beams of infinite transverse dimension radiating only one-dimensional E.M. waves (plane waves). Although these theories describe accurately the dynamics of the electrons during the FEL interaction process, neither the three dimensional nature of the radiated fields nor its non-monochromatic features can be properly studied by them. As a result of this, very important practical issues such as the gain per gaussian-spherical optical mode in a free electron laser have not been well addressed, except through a one dimensional field model in which a filling factor describes crudely the coupling of the FEL induced field to the input field. GRA

N82-32725# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. d'Etudes et de Recherches en Optique.
A TUNABLE DUAL FREQUENCY DYE LASER
Yvan Aubry 11 Dec. 1981 43 p refs In FRENCH; ENGLISH summary Prepared in cooperation with Ecole Nationale Superieure de l'Aeronautique et de l'Espace, Toulouse
(Contract CNES-81/0729)
(ONERA-DERO-1/6083-3) Avail: NTIS HC A03/MF A01

The tunable oscillator part of a pulsed dye laser was modified for emission of two wavelengths. The dye laser, including the oscillator followed by three amplifiers, is pumped by a dual frequency Nd-YAG laser. Tuning along with spectral width are controlled by a holographic network which is connected with a high power telescope. The modified two-wavelength dye laser allows absorption lidar techniques for remote sensing of the atmosphere. Rapid line switching is achieved by electro-optical commutation are presented. Author (ESA)

N82-32726# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Lasertechnik.

LASER ALTIMETER FOR STEREO LINE SCANNING

Christian Werner, Friedrich Koepp, and Friedrich Malota Dec. 1981 45 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-777)

(DFVLR-Mitt-82-06) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 13,50

A satellite-borne laser altimeter for applications in meteorology, oceanography and geodesy is described. The system parameters, and the weight and power requirements were determined. The system was compared with other planned systems, showing that only the altimeter part with weight of about 300 kg and power requirement of 1-5 kw is expensive. Interpretation problems arise with cloud applications. Due to the large power consumption a combined measurement using the WINDSAT experiment is proposed. Author (ESA)

N82-32727# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung Lasertechnik.

TEST REPORT OF AN EYE-SAFE LASER SLANT VISUAL RANGE MEASURING DEVICE

Christian Werner Feb. 1982 19 p refs In GERMAN; ENGLISH summary

(DFVLR-Mitt-82-07) Avail: NTIS HC A02/MF A01; DFVLR, Cologne DM 9,10

An eye safe laser ceilometer combined with a lidar receiver was built and tested. The ceilometer was used to detect the slant visual range. The combination of cloud height and slant visual range measurement represents an optimal use for airports. Author (ESA)

N82-32728# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany). Abteilung 1: Theoretische Geodaesie.

ASSESSMENT OF TECHNOLOGY REQUIREMENTS ASSOCIATED WITH SPACEBORNE LASER RANGING. VOLUME 1: MISSION ANALYSIS, IDENTIFICATION OF REPRESENTATIVE POINT POSITIONING EXPERIMENT AND DEFINITION OF ASSOCIATED MISSION CHARACTERISTICS AND INSTRUMENT PERFORMANCE NEEDS Final Report

J. Cuno, H. Drewes, R. Kelm, H. Mueller, C. Reigber, M. Berge (GRGS, Toulouse), and F. Nouel (GRGS, Toulouse) Paris ESA 5 Jun. 1981 113 p refs 2 Vol.

(Contract ESTEC-4405/80/NL-HP(SC))

(MBB-R3700/2558R-Vol-1; DGFI-1/80/SPALT;

ESA-CR(P)-1605-Vol-1) Avail: NTIS HC A06/MF A01

An experiment which monitors recent crustal movements along active tectonic faults is discussed. Nearly real time orbit prediction with meter accuracy is required for laser system acquisition and pointing. Orbital fits with decimeter rms deviations are needed over the test area to derive baseline information with centimeter precision from short arcs. Laser measurement accuracy within 3 cm and epoch time precision within 0.0000015 sec are required. Minimum elevation error should be < 20 deg. Author (ESA)

N82-32729# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.

ASSESSMENT OF TECHNOLOGY REQUIREMENTS ASSOCIATED WITH SPACEBORNE LASER RANGING. VOLUME 2: THEORETICAL CONSIDERATIONS AND ASPECTS OF SYSTEM REALIZATION Final Report

G. Barthel, K. Dietrich, T. Halldorsson, W. Krause, G. Leibold, and S. Manhart Paris ESA Mar. 1982 514 p refs 2 Vol.

(Contract ESTEC-4405/80/NL-NP(SC))

(MBB-R3700/2558R-Vol-2; ESA-CR(P)-1605-Vol-2) Avail: NTIS HC A22/MF A01

Long distance space to Earth range measurement systems and ground targets are discussed. Onboard data processing, and pointing subsystem requirements were derived. Range analysis demonstrates that high pulse energies are required if a YAG: Nd laser is used in a one color system. For a two color system, an alexandrite laser, and a distributed feedback dye laser with an excimer laser amplifier are feasible. A streak-tube receiver with a 20 cm telescope is assumed for signal detection. Ground target choice (solid or hollow retroreflector) depends on cost. The laser beams will not damage eyes. Author (ESA)

N82-32538*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

POWER COMBINING OF SEMICONDUCTOR LASERS: A REVIEW

J. Katz *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 87-94 refs (For primary document see N82-32529 23-31)

Avail: NTIS HC A10/MF A01 CSCL 20E

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N82-32730* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

CRYSTAL CLEAVING MACHINE Patent

Frederick C. Hallberg and John S. J. Benedicto, inventors (to NASA) Issued 10 Aug. 1982 7 p Filed 29 Aug. 1980 Supersedes N80-32246 (18 - 22, p 3071)

(NASA-Case-GSC-12584-1; US-Patent-4,343,287;

US-Patent-Appl-SN-182879; US-Patent-Class-125-23R;

US-Patent-Class-225-103) Avail: US Patent and Trademark Office CSCL 13I

A machine is disclosed for cleaving hard crystals. A typical example of which is lithium fluoride, with precision and uniformity and includes vertical axis positioning control means for an adjustable spring tension guided hammer mechanism employed to strike an anvil. A crystal cleaving shock wave transmitted to a cleaving blade is generated having an angulated cleaving edge in contact with one corner of the crystal. Connection between the anvil and the blade is by means of a pair of vertical shafts held in substantially friction free engagement by two pairs of adjustable linear bearings. An underlying crystal holding fixture with horizontal position control means includes a zero reference stop face for the crystal and opposing spring-loaded clamping and vertical positioning elements which are precisely guided.

Official Gazette of the U.S. Patent and Trademark Office

N82-32731* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

APPARATUS FOR SEQUENTIALLY TRANSPORTING CONTAINERS Patent

Jerry L. Hudgins, inventor (to NASA) Issued 10 Aug. 1982 9 p Filed 11 Jul. 1980 Supersedes N80-29704 (18 - 20, p 2709)

(NASA-Case-MFS-23846-1; US-Patent-4,343,584;

US-Patent-Appl-SN-168944; US-Patent-Class-414-222;

US-Patent-Class-414-226; US-Patent-Class-414-739;

US-Patent-Class-294-116) Avail: US Patent and Trademark Office CSCL 13I

Apparatus for transferring and manipulating a plurality of containers in a sequence is disclosed including a mechanical manipulator arm having a gripping device which automatically picks up a container at a fixed pickup position P and transfers it to a processing station. At a processing station X, the container is loaded with silicon wafers and thereafter returned by the arm to the fixed position P at the pickup and return station Y. A plurality of the containers may be processed in sequence from the fixed pickup position by providing a movable carriage upon which container pedestal platforms are supported, at least one of which is an elevator platform. The platforms include abutments for properly positioning the containers for accurate pickup by the manipulator arm.

Official Gazette of the U.S. Patent and Trademark Office

N82-32732* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MECHANICAL END JOINT SYSTEM FOR STRUCTURAL COLUMN ELEMENTS Patent
Harold G. Bush (Vought Corp., Hampton, Va.) and Richard E. Wallsom, inventors (to NASA) (Vought Corp., Hampton, Va.) Issued 20 Jul. 1982 9 p Filed 5 Dec. 1979 Supersedes N80-22704 (18 - 13, p 1719)
(NASA-Case-LAR-12482-1; US-Patent-4,340,318; US-Patent-Appl-SN-100611; US-Patent-Class-403-217; US-Patent-Class-403-317; US-Patent-Class-403-331; US-Patent-Class-403-340; US-Patent-Class-52-81) Avail: US Patent and Trademark Office CSCL 13I

A mechanical end joint system, useful for the transverse connection of strut elements to a common node, comprises a node joint half with a semicircular tongue and groove, and a strut joint half with a semicircular tongue and groove. The two joint halves are engaged transversely and the connection is made secure by the inherent physical property characteristics of locking latches and/or by a spring-actioned shaft. A quick release mechanism provides rapid disengagement of the joint halves.
Official Gazette of the U.S. Patent and Trademark Office

N82-32733*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
KINEMATIC PRECISION OF GEAR TRAINS
F. L. Litvin (Illinois Univ. at Chicago Circle), R. N. Goldrich (Illinois Univ. at Chicago Circle), John J. Coy (AVRADCOM Research and Technology Lab., Cleveland, Ohio), and E. V. Zaretsky 1982 40 p refs Proposed for presentation at the Winter Ann. Meeting of the ASME, Phoenix, 15-19 Nov. 1982
(NASA-TM-82887; E-1191; NAS 1.15:82887; AVRADCOM-TR-82-C-10) Avail: NTIS HC A03/MF A01 CSCL 13I

Kinematic precision is affected by errors which are the result of either intentional adjustments or accidental defects in manufacturing and assembly of gear trains. A method for the determination of kinematic precision of gear trains is described. The method is based on the exact kinematic relations for the contact point motions of the gear tooth surfaces under the influence of errors. An approximate method is also explained. Example applications of the general approximate methods are demonstrated for gear trains consisting of involute (spur and helical) gears, circular arc (Wildhaber-Novikov) gears, and spiral bevel gears. Gear noise measurements from a helicopter transmission are presented and discussed with relation to the kinematic precision theory. S.L.

N82-32734*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE INFLUENCE OF SURFACE DENTS AND GROOVES ON TRACTION IN SLIDING EHD POINT CONTACTS
C. Cusano (Illinois Univ., Urbana-Champaign) and L. D. Wedeven 1982 14 p refs Proposed for presentation at the Joint Lubrication Conf., Washington, D.C., 5-7 Oct., 1982; sponsored by AMSE and Am. Soc. of Lubrication Engr.
(NASA-TM-82943; E-1345; NAS 1.15:82943) Avail: NTIS HC A02/MF A01 CSCL 20K

Changes in traction, caused by dents and grooves on a highly polished ball, are investigated as these defects approach and go through sliding elastohydrodynamic point contacts. The contacts are formed with the ball loading against a transparent disk. The ball and thus the topographical features are held stationary at various locations in the vicinity and within the contact while the disk is rotating. These topographical features can cause substantial changes in the traction when compared to traction obtained with smooth surfaces. S.L.

N82-32735*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PLASTIC DEFORMATION AND WEAR PROCESS AT A SURFACE DURING UNLUBRICATED SLIDING
Takashi Yamamoto (Tokyo Univ. of Agriculture and Technology, Japan) and Donald H. Buckley 1982 36 p refs Proposed for presentation at the Joint Lubrication Conf., Washington, D.C., 4-6 Oct. 1982; sponsored by ASME and the Am. Soc. of Lubrication Engr.
(NASA-TM-82820; E-1168; NAS 1.15:82820) Avail: NTIS HC A03/MF A01 CSCL 20K

The plastic deformation and wear of a 304 stainless steel surface sliding against an aluminum oxide rider with a spherical surface (the radius of curvature: 1.3 cm) were observed by using scanning electron and optical microscopes. Experiments were conducted in a vacuum of one million Pa and in an environment of fifty thousandth Pa of chlorine gas at 25 C. The load was 500 grams and the sliding velocity was 0.5 centimeter per second. The deformed surface layer which accumulates and develops successively is left behind the rider, and step shaped proturbances are developed even after single pass sliding under both environmental conditions. A fully developed surface layer is gradually torn off leaving a characteristic pattern. The mechanism for tearing away of the surface layer from the contact area and sliding track contour is explained assuming the simplified process of material removal based on the adhesion theory for the wear of materials. S.L.

N82-32736*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF SHOT PEENING ON SURFACE FATIGUE LIFE OF CARBURIZED AND HARDENED AISI 9310 SPUR GEARS
Dennis P. Townsend and Erwin V. Zaretsky Aug. 1982 14 p refs
(NASA-TP-2047; E-936; NAS 1.60:2047) Avail: NTIS HC A02/MF A01 CSCL 13I

Surface fatigue tests were conducted on two groups of AISI 9310 spur gears. Both groups were manufactured with standard ground tooth surfaces, with the second group subjected to an additional shot peening process on the gear tooth flanks. The gear pitch diameter was 8.89 cm (3.5 in.). Test conditions were a gear temperature of 350 K (170 F), a maximum Hertz stress of 1.71 billion N/sq m (248,000 psi), and a speed of 10,000 rpm. The shot peened gears exhibited pitting fatigue lives 1.6 times the life of standard gears without shot peening. Residual stress measurements and analysis indicate that the longer fatigue life is the result of the higher compressive stress produced by the shot peening. The life for the shot peened gear was calculated to be 1.5 times that for the plain gear by using the measured residual stress difference for the standard and shot peened gears. The measured residual stress for the shot peened gears was much higher than that for the standard gears. S.L.

N82-32737*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
WEAR MECHANISM BASED ON ADHESION
Takashi Yamamoto and Donald H. Buckley Aug. 1982 13 p refs
(NASA-TP-2037; E-1118; NAS 1.60:2037) Avail: NTIS HC A02/MF A01 CSCL 11A

Various concepts concerning wear mechanisms and deformation behavior observed in the sliding wear track are surveyed. The mechanisms for wear fragment formation is discussed on the basis of adhesion. The wear process under unlubricated sliding conditions is explained in relation to the concept of adhesion at the interface during the sliding process. The mechanism for tearing away the surface layer from the contact area and forming the sliding track contour is explained by assuming the simplified process of material removal based on the adhesion theory. S.L.

N82-32738# Washington Univ., Seattle. Lab. of Applied Physics.
O-RING INSTALLATION FOR UNDERWATER COMPONENTS AND APPLICATIONS Final Report
Colin J. Sandwith 15 Apr. 1982 94 p refs
(Contract N00024-78-C-6018; NR Proj. 590-584)
(AD-A116393; NRL-MR-4809) Avail: NTIS HC A05/MF A01 CSCL 11/1

This Handbook provides a standard procedure for installing

O-ring seals in components designed for undersea applications. The undersea applications of primary concern here are components such as electrical connectors and fittings for sonar systems on submarines, surface ships, and other marine structures where seal reliability is critical. The principles and procedures recommended, however, can be applied to other static and some dynamic underwater seals. Although O-rings are the only type of gasket discussed, the principles and most of the procedures can be applied to quad-rings and other forms of seal gaskets. The Handbook also provides general information to engineers, machinists, supply personnel, and procurement personnel concerning selection, design, storage, and handling of seal parts to ensure high reliability of the final seal assembly. It addresses lubricants and reliability as they apply to seal installation. Author (GRA)

N82-32739# ILC Dover, Frederica, Del. Inflatable Products Dept.
DESIGN AND DEVELOPMENT OF A 5,000 BARREL COLLAPSIBLE FABRIC PETROLEUM FUEL TANK ASSEMBLY, PHASE 2 Final Report, 31 Jan. - 10 Jul. 1981
Curt R. Graham and George P. Durney 21 Aug. 1981 36 p
(Contract DAAK70-79-C-0211)
(AD-A116416) Avail: NTIS HC A03/MF A01 CSCL 13/4

ILC Dover, after developing two leading candidate coated fabrics for use on the 5,000 barrel collapsible fabric fuel tank, designed and fabricated that fuel tank for testing in the tropics. The tank was built from the polyurethane coated Kevlar fabric. ILC designed high stress compression rings and a wick-proff suction stub for use on the tank. Commercial products were found to be acceptable for all other hardware. Author (GRA)

N82-32740# Ohio State Univ., Columbus. Dept. of Electrical Engineering.
DESIGN STUDY FOR AN ACTIVELY TERRAIN-ADAPTIVE OFF-ROAD VEHICLE Final Report, 29 Jan. 1981 - 28 Jan. 1982
Robert B. McGhee and Kenneth J. Waldron 3 Jun. 1982 191 p refs
(Contract MDA903-81-C-0138)
(AD-A115600; LPN-OSURF-762565/713786) Avail: NTIS HC A09/MF A01 CSCL 13/6

This project consisted of studies directed at establishing the feasibility of building a practical vehicle using fully adaptive legged locomotion. The objective of building such a vehicle is mobility in extreme rough terrain conditions. New technologies essential to feasibility include computer control of leg coordination, efficient power transmission for coordinated motion of large numbers of mechanical degrees of freedom, development of terrain sensing systems and utilization of the information provided by those systems in control of the machine. Author (GRA)

N82-32741# Columbia Univ., New York. Lubrication Lab.
AN INVESTIGATION OF THE FUNDAMENTAL PROPERTIES OF GREASE-LUBRICATED BEARINGS Final Report
H. G. Elrod and Richard H. Buckholz May 1982 13 p
(Contract N00014-79-C-0407)
(AD-A116785) Avail: NTIS HC A02/MF A01 CSCL 11/8

Grease is used as a lubricant for large numbers of bearings in everyday use; but the non-Newtonian rheological properties of these thixotropic gels, and their effect upon journal-bearing performance, are not well understood. To initiate a program in grease lubrication, we reactivated a concentric-cylinder journal-bearing test apparatus used by Smith and Fuller. This particular configuration has been treated extensively by theoreticians for constant viscosity lubricants, and to a considerably lesser extent for non-Newtonian lubricants. Smaller amounts of experimental data exist for both types of lubricants. The journal-bearing test apparatus was operated first as a concentric-cylinder viscometer, and the shear viscosity of SAE 10 oil measured. Subsequently, the apparent shear viscosity of a lithium-based grease (Sears and Roebuck) was measured as a function of rate of strain and of temperature. Performance of the grease-lubricated journal bearing was characterized by experimental determination of the coefficient of friction as a function of the bearing number ZN/p. As expected, the high shear viscosity of the grease (with corresponding high bearing number) was found to permit operation at lower RPMs. Author (GRA)

N82-32742# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
LABYRINTH SEAL EFFECTS ON ROTOR BEARING SYSTEM STABILITY M.S. Thesis
Anthony John Pavelko May 1982 170 p refs
(AD-A116774; AFIT-NR-82-10T) Avail: NTIS HC A08/MF A01 CSCL 13/9

This thesis presents a stability analysis of rotor bearing system operation affected by a single labyrinth seal. Labyrinth seals, primarily intended for leakage control in turbines, have been observed to affect rotor stability in high pressure steam turbines. A small experimental rotor bearing system, existing in the Mechanical Engineering Department, and a compatible labyrinth seal are the subjects of this analysis. Linear analytical models of these rotor bearing and labyrinth seal systems, both isolated and coupled, are developed. Labyrinth seal geometry and pressure variations generate various affects on rotor bearing system stability. These affects can help develop labyrinth seal design criteria directed toward high pressure turbine stability enhancement. Author (GRA)

N82-32743# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering and Applied Mechanics.
EROSION STUDY IN TURBOMACHINERY AFFECTED BY COAL ASH PARTICLES Final Report
W. Tabakoff, A. Hamed, and E. Beacher Oct. 1981 42 p refs
(Contracts DE-AC01-76ET-10620; E(49-18)-2465)
(FE-2465-13; DOE/ET-10620/13) Avail: NTIS HC A03/MF A01

Small particle trajectories approaching the test specimen in an erosion tunnel were determined. The dimensional equations of motion are solved for a spherical particle under the sole influence of aerodynamic drag. The two dimensional gradients of gas properties in the flow field are determined by a numerical solution of the equations describing a compressible inviscid fluid. At one inlet condition, the trajectories are computed for coal ash particles of various sizes approaching test specimens at several orientations. Trends are identified in the approaching characteristics that may be related to the erosion. Significant numbers are deflected away from the specimen for ash particles with diameters less than 10 microns. It is found that ash partiles with diameters less than 30 microns, which do impact the specimen, do so over a wise range of incident angles quite different from the angle between the specimen surface and the tunnel axis and at lower velocities than those at the test section inlet. DOE

N82-32744# Northern Research and Engineering Corp., Woburn, Mass.
TEST PLAN: RESEARCH AND DEVELOPMENT FOR IMPROVED EFFICIENCY, SMALL STEAM TURBINE. PHASE 52, REVISION A
Dec. 1981 37 p
(Contract DE-AC02-79ET-15426)
(DE82-011429; DOE/ET-15426/T20) Avail: NTIS HC A03/MF A01

The development of a family of high efficiency radial inflow steam turbines (RIT) which meet the demands of the small (500 to 5000 hp) steam turbine market, such that significant market penetration, hence significant savings in the nation's use of energy will result, is described. The RIT must exhibit great reliability and relatively low first costs resulting from parts standardization as well as high efficiency. The market for small steam turbines was examined and the family of radial inflow turbines best suited to penetrate the market was identified. A particular RIT configuration is selected to be designed, built and tested during the second phase of the program. DOE

N82-32745# Centre Technique des Industries Mecaniques, Senlis (France).
CALCULATION OF THE POWER NEEDED FOR MACHINING Final Report [CALCUL DE LA PUISSANCE EN USINAGE]

J. P. Fantin 8 Mar. 1982 41 p refs In FRENCH
(CETIM-13-D-41-2) Avail: NTIS HC A03/MF A01

Preliminary calculation of the power needed in order to carry out an industrial machining operation is considered. Findings provide a basis for the choice of tooling conditions and help rationalize the use of power available on a machine. Calculations are limited to determining the power needed at the tool in function of parameters linked of the process of removing the cutting. The method is empirical and is based on formulas derived from experimental results. The method is illustrated for machine operations on a turret lathe and on a milling machine.

Author (ESA)

N82-32746# Centre Technique des Industries Mecaniques, Senlis (France).

TRANSFER OF INTEGRATED INSPECTION TECHNOLOGY: BEARING RACES [TRANSFERT DU CONTROLE INTEGRE: CAS DES BAGUES DE ROULEMENT]

J. Rivenez Nov. 1981 5 p In FRENCH 2 Vol.
(CETIM-15-H-424-Vol-2) Avail: NTIS HC A02/MF A01

The feasibility of inspecting bearing races during machining while the part remains on the tool and simultaneous with manufacturing operations was studied. Similar inspection techniques, which are known to be possible in the case of machining large forged workpieces, are cited. Ultrasonic inspection appears to be the best adapted to bearing race lathing. However, economic and tooling considerations render a changeover unattractive at this time. Author (ESA)

N82-32747# Centre Technique des Industries Mecaniques, Senlis (France).

TEST METHOD FOR HYDRAULIC MOTORS AT LOW SPEED, PART 1 Final Report [METHODES ESSAIS MOTEURS LENTS]

J. P. Lecerf 27 Mar. 1979 90 p In FRENCH
(CETIM-15-J-030) Avail: NTIS HC A05/MF A01

A quick, simple, economical test method for the characterization, with good reliability, of hydraulic motor performance was developed. Low speed (the operating regime between full stop and the rated operating speed) performance characteristics were sought. Two test methods are defined: (1) pressure at constant speed and (2) torque at constant duty. Results with method (1) particularly concern hydraulic winches where constant load is desired, while method (2) results are of interest in pump testing where constant speed is needed. The test bench is described. Preliminary results are evaluated, indicating the suitability of this performance test equipment. Author (ESA)

N82-32748# Centre Technique des Industries Mecaniques, St. Etienne (France).

DESIGN OF AN ADAPTABLE LATHING WORK STATION: FUNCTIONAL DESIGN CRITERIA Final Report [CELLULE FLEXIBLE DE TOURNAGE]

M. Jubin Jan. 1982 41 p In FRENCH
(CETIM-1.4N-15-2) Avail: NTIS HC A03/MF A01

With reference to production automation, an adaptable lathing tool, computerized control equipment, and peripheral workpiece manipulator are defined. The automated work station handles parts of varying geometry and is capable of operating over a period of several hours without human supervision. Choices of technology for the lathe, robot, and robot manipulator arm are presented. The types of workpieces likely to be manufactured by this machine are described. The minicomputer is discussed. Workpiece handling is depicted, including detection of blank geometry, tolerances, and malfunctions or breakdowns.

Author (ESA)

N82-32749# Centre Technique des Industries Mecaniques, St. Etienne (France).

BONDED ASSEMBLIES: COMPARISON OF NORMS AND METHODS OF SHEAR TESTING BY TRACTION [ASSEMBLAGES COLLES: COMPARAISON DE NORMES ET DE METHODES D'ESSAI DE CISAILLEMENT PAR TRACTION]

D. Benazet and Y. Noblet Oct. 1981 7 p ref In FRENCH
(CETIM-N-2X-00-C) Avail: NTIS HC A02/MF A01

A French norm (NFT 76 107) which defines the dimensions of a standard test specimen for the qualification of structural glues by traction shear testing is presented. Results obtained with a structural adhesive and different traction shear specimens are compared. Results show that the unitary strength of a bond is in function of the geometric parameters of the assembly. These are thickness of the bonding surfaces, thickness of the glue layer, and bonded surface area (principally length). Author (ESA)

N82-32750# Centre Technique des Industries Mecaniques, St. Etienne (France).

ADHESIVE BLOCKING OF NUTS ON BOLTS Final Report [FREINAGE PAR ADHESIFS EN BOULONNERIE]

D. Benazet, J. Zirah, H. Ancenay, and Y. Noblet 11 Feb. 1982 41 p In FRENCH
(CETIM-1.3N-22-1) Avail: NTIS HC A03/MF A01

Anaerobic glues, used to block nuts on bolted assemblies, were studied. Bonding agent choice criteria and application technology were investigated through the literature. The different families of adhesives are described. Mechanical characteristics, claimed by the manufacturers, are summarized in tables. Wide disparity in resuits indicates the need for normalization in the application and testing of this technology. Author (ESA)

N82-32751# Centre Technique des Industries Mecaniques, St. Etienne (France).

MONITORING MACHINES: GEARDOWN MECHANISMS. METHODS FOR THE ANALYSIS OF CONTAMINATION OF INDUSTRIAL LUBRICANTS [SURVEILLANCE DES MACHINES - CAS DES REDUCTEURS A ENGRENAGES. METHODES D'ANALYSE DE LA CONTAMINATION DES LUBRIFIANTS INDUSTRIELS]

Michel Ganier, Nicole Ollier, and Alain Ridard Aug. 1981 59 p In FRENCH
(CETIM-1.5J-04-1; Rept-6) Avail: NTIS HC A04/MF A01

Techniques for the lubricant analysis in service, which detect operating anomalies in machines and enable monitoring wear phenomena, were surveyed. A large reduction box was monitored in the laboratory. Oil analysis methods involve: (1) determination of water and sediment content by centrifuging; (2) determination of pollution in a fluid by gravimetry; (3) measurement of contamination by membrane filtration; (4) analysis by emission spectrometry; and (5) ferrographic analyses. The choice of analysis method depends on the type of machine to be monitored (hydraulic motor; geardown mechanism; compressor) and the lubricant sampling frequency required. Author (ESA)

N82-32752# Centre Technique des Industries Mecaniques, Nantes (France).

STUDY OF PROBLEMS POSED BY THE EMISSION OF FUMES DURING WELDING, PART 3 Final Report [ETUDE DES PROBLEMES POSES PAR L'EMISSION DE FUMEES AU COURS DU SOUDAGE (TROISIEME PARTIE)]

29 Mar. 1982 132 p refs In FRENCH
(CETIM-12-Y-373-Pt-3) Avail: NTIS HC A07/MF A01

Measurement methods which are used to sample dust in the air during welding were investigated. The influences of the type of filter, sensor shape, and electrical parameters were determined. After the definition of a reliable dust sampling system, arc welding fumes were studied. Results show that the total quantity of dust emitted with flux coated stainless steel electrodes is of the same order of magnitude as with flux coated nonalloyed steel electrodes. Author (ESA)

N82-32753# Centre Technique des Industries Mecaniques, Senlis (France).

ACOUSTIC MONITORING DURING WELDING. TESTS FOR THE CHARACTERIZATION OF ACOUSTIC EMISSION ON THE BEAD DURING COOLING [ECOUTE ACOUSTIQUE EN COURS DE SOUDAGE. ESSAIS DE CARACTERISATION DE L'EMISSION ACOUSTIQUE DU LAITIER LORS DU REFROIDISSEMENT]

M. Nogues and J. Roget Apr. 1982 38 p In FRENCH

(CETIM-15-Y-121-Pt-3; Rept-3) Avail: NTIS HC A03/MF A01

The monitoring of acoustic emissions during submerged arc welding is discussed. Cracking and scaling in the weld bead as it cools down constitutes a major source of parasitic noise. Melting and cooling tests were conducted, using welding rod type UM89 to characterize this noise. Results show that weld flaws primarily form in the temperature range 900 to 600 C, while between 600 and 180 C acoustic emission is due to bead cooling. The two phenomena can be differentiated only by simultaneously monitoring the temperature as associated acoustic emission spectra are practically identical. Author (ESA)

N82-32754# Centre Technique des Industries Mecaniques, Senlis (France).
BOUNDS IN RIGHT HAND TOOTHED INTERIOR GEARS: PART 1: APPLICATIONS [CONTRAINTES DANS LES ENGRENAGES INTERIEURS. A DENTURES DROITES. EXPLOITATION PREMIERE PARTIE]
Borrien Apr. 1981 112 p In FRENCH
(CETIM-N-4-H-271) Avail: NTIS HC A06/MF A01

Two computer programs designed for computation of teeth profiles and boundary conditions are discussed. The first program, implemented in FORTRAN on a HR6420 computer, establishes the teeth profile. The second program, implemented in FORTRAN on a CDC7600 computer, uses integral equations to compute boundary restrictions. Both programs are utilized in a series of 27 examples and the evolution of several characteristic factors is studied. A method for the design of interior gears is derived. Author (ESA)

N82-32755# Institut de Soudure, Paris (France).
SOFT BRAZING OF METALS WITH A PROTECTIVE COATING, VOLUME 2 Final Report [BRASAGE TENDRE DE METAUX REVETUS D'UNE COUCHE DE PROTECTION (DEUXIEME PARTIE)]
Senlis, France Centre Technique des Industries Mecaniques 9 Feb. 1982 67 p In FRENCH 2 Vol.
(Contract CETIM-4-79-9265)
(CETIM-12-Y-132-Vol-2; IS-12328-Vol-2) Avail: NTIS HC A04/MF A01

The influence of the protective coating, surface characteristics and solder aging on the mechanical characteristics of soldered joints was experimentally determined using nine types of protective layers, two types of surface and four aging conditions. No substantial difference is found between types of protective coating. The average weld strengths are grouped from 40 to 60 MPa. Good surfaces wetting was observed for Sn, Sn-Pb, Ag, Au and Au-Ni protective coatings. Author (ESA)

N82-32756# Institut de Soudure, Paris (France).
SOFT BRAZING OF METALS PROVIDED WITH A PROTECTIVE COATING, VOLUME 1 [BRASAGE TENDRE DES METAUX REVETUS D'UNE COUCHE DE PROTECTION (PREMIERE PARTIE)]
Senlis, France Centre Technique des Industries Mecaniques Sep. 1978 110 p In FRENCH 2 Vol.
(CETIM-12-Y-132-Vol-1; IS-8-186-Vol-1) Avail: NTIS HC A06/MF A01

A technique for obtaining soldered samples was developed, in order to characterize the influence of several factors on printed circuit weld strength, particularly the influence of the protective coatings. A weld strength test machine was designed to measure the quality of the component to circuit board joints. The experimental results show a dispersion of weld strengths due to the influence of the experimental parameters much larger than the method accuracy. The shear strain measurement error is estimated at 1 micron. It is suggested that shear velocity rather than shear strenght is a better parameter for the analysis of the influences of the surface coatings. Author (ESA)

N82-32527# Technion - Israel Inst. of Tech., Haifa. Dept. of Mechanical Engineering.
A REVIEW OF MECHANICAL FACE SEAL DYNAMICS
I. Etsion *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 3 Mar. 1982 p 9-14 refs (For primary document see N82-32525 23-31)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 11/1

N82-32545*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CONSCAN IMPLEMENTATION FOR ANTENNA CONTROL ASSEMBLY
J. E. Ohlson (Stanford Telecommunications, Inc.) and K. P. Abichandani *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 153-160 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 13I

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N82-32757# Stanford Univ., Calif. Lab. of Physics.
ACOUSTIC MICROSCOPY AT CRYOGENIC TEMPERATURES
Jun. 1982 6 p refs
(Contract N00014-77-C-0412; NR Proj. 384-924)
(AD-A116329; GL-3435) Avail: NTIS HC A02/MF A01 CSCL 14/5

Some years ago it became evident that research devoted to acoustic microscopy at cryogenic temperatures would allow us to realize the full potential of this new instrument and extend the resolving power beyond the limits imposed by the room temperature microscope. In 1977, the Office of Naval Research agreed to fund such a program at Stanford University. It was to be directed toward an increase in our understanding of the propagation of acoustic waves in cryogenic fluids and the physics of imaging with these waves. We were to concern ourselves with the submicron region. This short report includes a compilation of the written materials and presentations that have resulted from this program. The work of Dr. Logan Hargrove, who has guided the program since its inception, is deeply appreciated. Cryogenic fluids are attractive for propagation of acoustic waves with short wavelengths since the velocity of sound is low and the attenuation is moderate. Much of our work has been done with liquid argon and liquid nitrogen. High quality acoustic images have been recorded in these media and it has been shown that an operating instrument can be a rather simple device. GRA

N82-32758# Army Construction Engineering Research Lab., Champaign, Ill.
ELECTRO-OPTIC SYSTEM FOR NONDESTRUCTIVE TESTING OF FIELD WELDS
Frank W. Kearney and Chester S. Gardner Mar. 1982 67 p refs
(AD-A115758; CERL-TR-M-309) Avail: NTIS HC A04/MF A01 CSCL 13/5

This report describes a prototype system developed for real-time, in-process weld quality control. The system uses weld-arc spectral analyses done by an electro-optic detection device. The results of this study indicate that it may be possible to monitor many flaw-inducing conditions such as loss of shielding gas, loss of flux, and hydrogen embrittlement by observing specific regions of the arc spectra. This report also describes the design and initial tests of a microprocessor control spectrograph. The hardware configuration of the system described in this report can be easily adapted to field operation for onsite, inprocess weld quality control. GRA

N82-32759# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
RELIABILITY GROWTH AND ITS APPLICATIONS TO DORMANT RELIABILITY M.S. Thesis

John Frederick VonLoh Dec. 1981 128 p refs
(AD-A115577; AFIT/GOR/MA/81D-12) Avail: NTIS HC A07/MF A01 CSCL 15/3

This thesis presents the results of an extensive literature search into reliability growth and the subsequent use of three reliability growth models to predict dormant reliability. A brief review of reliability theory is followed by a survey of reliability growth models, which includes the detailed developments of and specific examples for five popular models. The nature of dormant reliability is then discussed as a prelude to a Monte Carlo analysis using the Duane, Gompertz, and Bonis reliability growth models to predict dormant reliability. Author (GRA)

N82-32760# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

CONFIDENCE INTERVALS FOR SYSTEM RELIABILITY AND AVAILABILITY OF MAINTAINED SYSTEMS USING MONTE CARLO TECHNIQUES M.S. Thesis

Mohamed Shibl Biltagy Hasaballa Dec. 1981 109 p refs
(AD-A115573; AFIT/GOR/MA/81D-7) Avail: NTIS HC A06/MF A01 CSCL 12/1

This thesis presents the results of an extensive literature search for finding the confidence intervals for system reliability and availability of maintained systems using Monte Carlo techniques. The characteristics of system reliability and maintainability analysis are discussed. The basic Markovian failure and repair models are developed. A summary of the point estimates of availability, reliability of maintained systems, and the exact analytical methods are presented. Finally, the Bootstrap (Double Monte Carlo technique) is used to obtain the confidence limits for the availability of the maintained systems. Author (GRA)

N82-32761# Centre Technique des Industries Mecaniques, St. Etienne (France).

BIBLIOGRAPHICAL STUDY OF NONDESTRUCTIVE TESTS FOR ADHESIVE BONDS Final Report [ETUDE BIBLIOGRAPHIQUE DES MOYENS DE CONTROLE NON DESTRUCTIF ENVISAGEABLES POUR LES COLLAGES]

D. Benazet Sep. 1981 29 p refs In FRENCH
(CETIM-1.3N-202) Avail: NTIS HC A03/MF A01

Nondestructive test techniques for the characterization of bonded structures and adhesive joints were described. The methods are classified into four categories: (1) surface characterization; (2) discernment of the presence of glue and its porosity; (3) bonding agent cohesion tests; and (4) bonding agent adhesion tests. Nondestructive testing research comprehends the use of holography, IR radiation, ultrasonic methods, and measurement of Foucault current. Other methods use sonic resonance, Stoneley waves, acoustic emission, or fine structure analysis of ultrasonic signals. Methods for testing honeycomb materials are included. Author (ESA)

N82-32762# Centre Technique des Industries Mecaniques, St. Etienne (France).

MONITORING DURABILITY TESTS BY ACOUSTIC EMISSION: APPLICATION TO ELASTOMER STUDS UNDERGOING TRACTION [SUIVI DES ESSAIS D'ENDURANCE PAR EMISSION ACOUSTIQUE. APPLICATION SUR DES PLOTS EN ELASTOMERE SOLLICITES EN TRACTION]

M. Sorel and C. Schepacz Mar. 1982 60 p In FRENCH
(CETIM-1.5Y-10-3; Rept-1) Avail: NTIS HC A04/MF A01

Nondestrucitve testing of elastomer vibration isolators as part of manufacturing quality control was undertaken. The vibration isolators consist of an elastomer stud with threaded metal connectors affixed at each end. Previously, a traction test was used to verify the quality of the elastomer stud/connector bond. Acoustic emission monitoring was introduced to discern good assemblies from bad before irreversible damage occurred. It is shown that while applying only a very slight traction load, acoustic emission signal analysis allows for the identification of defective parts. Author (ESA)

N82-32763# Centre Technique des Industries Mecaniques, Nantes (France).

ON THE CORRELATION BETWEEN CABLE FATIGUE AND NONDESTRUCTIVE TESTING WITH CABLOTEST Final Report [CORRELATION FATIGUE DE CABLES. CONTROLE NON DESTRUCTIF PAR CABLOTEST]

P. Mercier 31 Aug. 1981 28 p In FRENCH
(CETIM-14-Y-131) Avail: NTIS HC A03/MF A01

The test equipment, Cablotest, is presented. The equipment can be used to determine fatigue damage in long cables, e.g., on aerial tramways, by measurement of Foucault current. A series of measurements were made on test cables in order to determine the reliability of this method. Results show that Cablotest is very sensitive in detecting damage caused by cable flexing, provided an identical cable is first measured as a reference. This method is particularly useful in inspecting cables on which the grease excludes the possibility of a comprehensive visual inspection. Author (ESA)

N82-32764# Centre Technique des Industries Mecaniques, Senlis (France).

QUALIFICATION OF ULTRASONIC BEAMS Final Report [QUALIFICATION FAISCEAUX ULTRASONORES]

J. Rivenez and F. Chanvin Apr. 1982 50 p In FRENCH
(CETIM-15-H-395; Rept-1) Avail: NTIS HC A04/MF A01

Beam emission by a circular plate transducer based on the behavior of cylindrical reflectors is parametrically described. The reliability and reproducibility of ultrasonic flaw detection is discussed. A theoretical model of the ultrasonic beam is proposed while sound pressure at the reflector, reflection, and amplitude on reception are taken into account. A computer program which calculates amplitude of a beam diffracted by a linear reflector, perpendicularly to the axis of a transducer is shown. Author (ESA)

N82-32765# Centre Technique des Industries Mecaniques, Senlis (France).

MONITORING OF WELDS BY ACOUSTIC EMISSION. BIBLIOGRAPHICAL STUDY OF RESULTS OBTAINED DURING MULTIPASS SUBMERGED ARC WELDING [CONTROLE DU SOUDAGE PAR EMISSION ACOUSTIQUE. ETUDE BIBLIOGRAPHIQUE DES RESULTATS OBTENUS LORS DU SOUDAGE MULTIPASSES SOUS ARC SUBMERGE]

M. Nogues Mar. 1982 28 p refs In FRENCH
(CETIM-15-Y-121-Pt-2; Rept-2) Avail: NTIS HC A03/MF A01

Different methods of solid flux welding are reviewed and the possibility of monitoring weld quality by acoustic emission is discussed. Phenomena which account for acoustic emission during welding are identified. Characterization of acoustic emission with reference to various flaw types is described. A method of correlation (acoustic emission to flaw) is presented. The application of this technique on an industrial basis is presently feasible. Author (ESA)

N82-32766# Centre Technique des Industries Mecaniques, Senlis (France).

BIBLIOGRAPHIC STUDY ON THE POSSIBILITY OF CONTROLS BY ACOUSTIC EMISSION DURING WELDING [ETUDE BIBLIOGRAPHIQUE SUR LES POSSIBILITES DE CONTROLE EN COURS DE SOUDAGE PAR EMISSION ACOUSTIQUE]

M. Nogues Dec. 1981 40 p refs In FRENCH
(CETIM-15-Y-121-X) Avail: NTIS HC A03/MF A01

A literature review shows that most welding faults are detectable by acoustic tests, in which both the rate and the amplitude of the signal are altered by cracks and other defects. Author (ESA)

N82-32767# National Bureau of Standards, Washington, D.C. National Measurement Lab.

TECHNICAL ACTIVITIES, 1981, OFFICE OF NONDESTRUCTIVE EVALUATION Annual Report

Harold Berger, ed. and Leonard Mordfin, ed. Dec. 1981 126 p refs
(PB82-179003; NBSIR-82-2449; AR-4) Avail: NTIS

HC A07/MF A01 CSCL 14B

The technical activities of the nondestructive evaluation program are presented. Traceable measurements and improved procedures are described. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N82-32768 Defence Research Information Centre, Orpington (England).

PROCESSES IN MATERIAL EROSION DUE TO CAVITATION IN (OIL) HYDRAULIC SYSTEMS

W. Kleinbreuer and M. Pohl May 1982 30 p refs Transl. into ENGLISH from Olhydraul. und Pneumatik, (West Ger.), v. 25, no. 5, 1981 p 409-417

(DRIC-T-6615; BR83560) Copyright. Avail: Issuing Activity

Theories which explain cavitation erosion are reviewed, and temperature and pressure measurement on the eroded surface is discussed. Scanning electron micrograph studies of cavitation erosion of ductile, hard, and heterogeneous material surfaces are described. The erosion mechanism is not affected significantly by high temperatures produced by the implosion of cavitation bubbles. Implosion pressures and/or microjets cause material fatigue which, after plastic deformation, results in the excavation of small particles of material from the stressed surface. In the case of cavitation damage in oil hydraulics, the chemical attack component is of secondary importance. There is no direct link between individual material characteristic values and cavitation resistance. High tensile strength materials which exhibit a marked deformation capability are very resistant to cavitation. Author (ESA)

N82-32769 Dunfermline (Scotland).

CLOSED FORM SOLUTION FOR THE BENDING STRESSES IN RING-STIFFENED SHELLS WITH SHAPE IMPERFECTIONS

D. J. Creswell Dec. 1981 33 p refs

(AMTE(S)-R-81756; BR82767) Copyright. Avail: issuing Activity

A closed form solution for the displacements and stresses of a slightly noncircular, ring stiffened shell was derived from thin shell theory. It is suggested that the solution can be implemented on programmable pocket calculators. Displacements and stresses in widely and closely frame spaced submersible structures were evaluated. Results are in agreement with predictions of more usual matrix methods which require large computers. Author (ESA)

N82-32770# Dayton Univ., Ohio.

MAGNA: A FINITE ELEMENT PROGRAM FOR THE MATERIALLY AND GEOMETRICALLY NONLINEAR ANALYSIS OF THREE DIMENSIONAL STRUCTURES SUBJECTED TO STATIC AND TRANSIENT LOADING Interim Report, Oct. 1980 - Sep. 1981

Robert A. Brockman Wright-Patterson AFB, Ohio AFWAL Feb. 1982 624 p refs Supersedes AFWAL-TR-80-3152

(Contract F33615-80-C-3403; AF Proj. 2402)

(AD-A116541; AFWAL-TR-81-3181; AFWAL-TR-80-3152; UDR-TR-81-148) Avail: NTIS HC A99/MF A01 CSCL 12/1

The finite element program MAGNA (Materially and Geometrically Nonlinear Analysis), developed for the nonlinear static and dynamic analysis of complex three-dimensional structures, is described. This program is applicable to large structural response problems involving bars, membranes, plates, shells, and axisymmetric and three-dimensional solids, experiencing large displacements, finite strains, large rotations and plastic deformation. The theoretical basis of MAGNA and the numerical procedures employed are described in detail. Several sample analyses are presented to demonstrate the range of capabilities of the program. Instructions are provided for operating the program, modifying storage capacity, preparing input data, estimating computer run times, and interpreting the output. Computer graphics utilities available for the display of input data and analysis are also described. Author (GRA)

N82-32771# Northwestern Univ., Evanston, Ill. Dept. of Materials Science and Engineering.

RESIDUAL STRESSES AND SLIDING WEAR

J. W. Ho, C. Noyan, J. B. Cohen, V. D. Khanna (Texas Univ., Austin), and Z. Eliezer (Texas Univ., Austin) 25 May 1982 51 p refs

(Contract N00014-80-C-0116)

(AD-A115633; TR-7) Avail: NTIS HC A04/MF A01 CSCL 20/11

The residual stresses that develop during wear of SAE 1018 and 4340 steel have been examined. The entire three-dimensional stress tensor was obtained. A normal magnitude is too small to affect the wear rate. There are also significant shear stresses. The wear process rapidly alters any initial stress distribution produced by heat treatment or peening to such a degree that the wear rate is not affected by these stresses, unless they are initially larger than those that can be produced by the wear parameters. Author (GRA)

N82-32772# General Electric Co., Schenectady, N. Y.

NONLINEAR THERMOELASTIC EFFECTS IN SURFACE MECHANICS Final Report

J. M. Pitkin 1980 8 p refs

(Contracts N00014-80-C-0253; DAAG29-79-C-0204)

(AD-A115862) Avail: NTIS HC A02/MF A01 CSCL 20/13

The nonlinear thermoelastic equations are examined considering large deformations and temperature-dependent material parameters. Emphasis is on high-speed sliding contacts, wherein high temperatures localize near the contact surface, contributing to significance there of coupling terms neglected in elementary theory. Author (GRA)

N82-32773# Conselho Nacional de Pesquisas, Rio de Janeiro (Brazil). Lab. de Computacao Cientifica.

ANALYSIS OF STRESS AND DEFORMATION IN NONSTATIONARY CREEP

R. A. Feijoo, E. Taroco, and J. N. C. Guerreiro Dec. 1980 12 p refs In SPANISH

(DE81-700753; LCC-012/80) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A variational method and its algorithm to analyzes the stress and deformation in nonstationary creep is presented. The algorithm is applied to an infinite cylinder submitted to an internal pressure. The obtained solution is compared with the solution of nonstationary creep problems. DOE

N82-32774# Idaho National Engineering Lab., Idaho Falls.

DESIGN OF A MODEL TO STUDY DISPERSION IN FRACTURE NETWORKS

K. N. Koslow and L. C. Hull Jan. 1982 25 p refs

(Contract DE-AC07-76ID-01570)

(DE82-011316; EGG-ELS-5718) Avail: NTIS HC A02/MF A01

A method for evaluating the relationship between fracture network characteristics and dispersion of solutes is outlined. Dispersion is related to fracture characteristics such as spacing, width and orientation. DOE

N82-32775# Centre Technique des Industries Mecaniques, Senlis (France).

NOMINAL STRESSES FOR CALCULATIONS AS PER CODAP [CONTRAINTES NOMINALES DE CALCUL SUIVANT CODAP]

Dec. 1981 90 p In FRENCH

(CETIM-14-B-121) Avail: NTIS HC A05/MF A01

Norms relative to the dimensioning, or to verification of the dimensioning, of pressure vessel materials are presented. Nominal stress curves for calculations based on normal service conditions, and not including creep, are presented. The curves can also be used for calculations of abnormal service conditions.

Materials covered are: aluminum 1050 and 1080; titanium alloys; and Monel and Hastelloy. Author (ESA)

N82-32776# Centre Technique des Industries Mecaniques, Senlis (France).
THEORETICAL AND EXPERIMENTAL STUDY OF THREE DIMENSIONAL PHOTOELASTIC MEASUREMENT, VOLUME 1 Final Report [ETUDE THEORIQUE ET EXPERIMENTALE DE LA PHOTOELASTICIMETRIE TRIDIMENSIONNELLE]
M. Paraskevas Jan. 1982 82 p refs In FRENCH
(CETIM-15-G-151; CETIM-45-G-151) Avail: NTIS HC A05/MF A01

The development of three-dimensional photoelastic measurement, first on glass and later on plastic models, as a method of structural analysis and stress characterization is reviewed. Theory is summarized with reference to photoelastic models, three-dimensional photoelastic measurement by diffusion, and by mechanical cross sectioning. Measurement of polarized light in terms of Stokes vector form is also covered. A three phase method to study birefringent material is explained by showing calculation of the rotational capacity of a medium in a single direction. An extension of the matrix representation to the three dimensional case is also included. Author (ESA)

N82-32777# Centre Technique des Industries Mecaniques, Senlis (France).
CALCULATION OF THE PRESSURE BETWEEN BOLTED FLANGES ON A GASKET [CALCUL DE LA PRESSION ENTRE BRIDES ET JOINT SOUS L'ACTION DU SERRAGE]
M. Herve Oct. 1981 39 p In FRENCH
(CETIM-14-L-151) Avail: NTIS HC A03/MF A01

The pressure that two opposing flanges exert on a flat asbestos-elastomer gasket at the moment they are bolted together is calculated, using isoparametric triangular finite elements and the structural analysis computer program, CASTOR option E2D. Results vary widely, depending on the mechanical properties of the gasket and initial deformation of the flanges. It is essential that these characteristics be carefully measured before any comparison between simulation and experiment is attempted.
Author (ESA)

N82-32778# European Space Agency, Paris (France).
THE CRACK GROWTH RESISTANCE CURVE AS A SINGLE-PARAMETER REPRESENTATION OF STABLE CRACK PROPAGATION IN THIN-WALLED STRUCTURES
Werner Setz May 1982 283 p refs Transl. into ENGLISH of "Die Risswiderstandskurve als einparametrige Darstellungsform stabilen Rissfortschritts bei duennwandigen Strukturen" Rept. DFVLR-FB-80-35 DFVLR, Cologne, Oct. 1980 267 p
(ESA-TT-727; DFVLR-FB-80-35) Avail: NTIS HC A13/MF A01; original German version available from DFVLR, Cologne DM 41,60

Tensile tests were done on center cracked specimens. The materials chosen were 7075-T6, 7475-T761 and 2024-T3 aluminum alloys. The specimens were L-T orientated with the thickness in all cases 2 mm. By systematic variation of the specimen width and the initial crack length, the effect of these parameters on the crack growth resistance curve (R-curve) was investigated. The R-curves of the specimens tested are a single-valued function of the stress intensity up to a limiting value of the net section stress that is equal to 0.9 times the yield strength. The crack length was measured simultaneously by the potential and the compliance method. The potential method yields less scatter than the compliance method. The potential based R-curves were then used to predict failure by the R-curve concept. The results of failure prediction for elastic-plastic behavior support a recommandation for a standard test method, using R-curve measurements.
Author (ESA)

N82-32779# Oxford Univ. (England). Dept. of Engineering Science.
END STRESS CALCULATIONS ON ELASTIC CYLINDERS Final Report
P. J. D. Mayes and D. A. Spence Mar. 1982 60 p refs
(Contract DAJA37-80-C-0192)
(OUEL-1397/82) Avail: NTIS HC A04/MF A01

A Galerkin infinite matrices solution method was developed using weighting functions chosen so as to optimize the diagonal dominance of the infinite matrix. Stress in a semi-infinite circular elastic cylinder subjected to stress and displacement on its flat end, is considered. Mixed stress and displacement conditions are prescribed. The Love stress function can be expanded in a series of eigenfunctions of known form, where the coefficients calculation usually leads to infinite systems of linear equations which are solved by truncation. Stability of solution can only be guaranteed when the infinite matrix is diagonally dominated. The numerical results using the proposed method show an improvement in stability, and accurate solutions can be obtained using smaller matrices, thus producing a more efficient method of solution.
Author (ESA)

N82-32780# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium).
STUDY OF STEEL-CONCRETE INTERACTION IN COMPOSITE FLOORS WITH STRUCTURALLY PARTICIPATING FORM [ETUDE D'UNE LIAISON ACIER-BETON POUR PLANCHERS MIXTES AVEC COFFRAGE COLLABORANT]
J. Janss May 1982 30 p refs In FRENCH Sponsored by Inst. pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture
(CRIF-MT-147) Avail: NTIS HC A03/MF A01

Cold folded steel forms as reinforcement for concrete floor slabs were studied. A steel deck of folded light gage steel plate which has a profiled steel lattice spot welded to it was chosen. Mechanical reinforcing characteristics of the steel deck lattice structure in load tests were determined. It is shown that the attached lattice significantly improves the mechanical resistance of the steel plate. Composite steel deck concrete floor systems were also tested. Static loading and shear analysis results are presented. Author (ESA)

N82-32781# Centre Technique des Industries Mecaniques, Senlis (France).
CROSS SECTIONING THREE DIMENSIONAL STRUCTURES Final Report [COUPE DE STRUCTURES TRIDIMENSIONNELLES]
M. Afzali Dec. 1981 62 p refs In FRENCH
(CETIM-11-B-061) Avail: NTIS HC A04/MF A01

Subroutine algorithms of the computer program, CASTOR-30, are described. They can be used to: (1) verify a three-dimensional mesh and (2) determine the contours and mesh of surfaces within the contours of a structure for the calculation of temperature gradient stresses and displacements/temperatures for points on a two-dimensional mesh (cross section). Structural analysis is by the finite element method. Steps in setting up a problem are discussed. Application examples illustrate the algorithms.
Author (ESA)

N82-32782# Centre Technique des Industries Mecaniques, Senlis (France).
CALCULATION OF STIFFNESS COEFFICIENTS FOR FLANGES [CALCUL DES COEFFICIENTS DE RIGIDITE DE BRIDES]
D. Marquand Apr. 1982 29 p In FRENCH
(CETIM-14-L-151) Avail: NTIS HC A03/MF A01

The different stiffness coefficients for two pipe flanges were calculated. Only the reaction of the gasket and the force of bolting were taken into account. These two forces being equal, the behavior of the flange was studied, axially fixing the upper part of the plate at the level of the bolting circle and applying pressure on the plane of the gasket. Computation of deformations was accomplished with the computer program, CASTOR-E20, based on the finite element method. Results are shown in terms of triangular isoparametric finite elements. Author (ESA)

N82-32783# Centre Technique des Industries Mecaniques, Senlis (France).

STUDY ON THE SUBSTITUTION OF A HYDRAULIC TEST BY A PNEUMATIC TEST IN THE CASE OF LARGE PRESSURIZED VESSELS Final Report [ETUDE DES CONDITIONS DE REMPLACEMENT DE L'EPREUVE HYDRAULIQUE PAR UNE EPREUVE PNEUMATIQUE DANS LE CAS DES GRANDS APPAREILS A PRESSION: ETUDE PREALABLE]

P. Dumousseau Sep. 1981 53 p In FRENCH
(CETIM-15-Y-099) Avail: NTIS HC A04/MF A01

An enquiry on the substitution of hydraulic tests by pneumatic tests was carried out among the producers of pressurized vessels. A research program to quantify the cost factors involved in the substitution was also outlined. Safety risks and economic advantages of eliminating the hydraulic test when the water load requires an overdimensioning of the vessels or when the remaining water traces are detrimental to the application of the vessel were discussed. Author (ESA)

N82-32784# Southampton Univ. (England). Inst. of Sound and Vibration Research.

STUDY OF THE EVOLUTION OF STRUCTURAL ACOUSTIC DESIGN GUIDES, VOLUME 2

B. L. Clarkson, R. J. Pope, and M. F. Ranky Paris ESA Jun. 1981 83 p refs 2 Vol.
(Contract ESA-4118/79/NL-AK)
(ISVR-TR-3-2-Vol-2; ESA-CR(P)-1609-Vol-2) Avail: NTIS HC A05/MF A01

The vibration levels at equipement mounting points on satellite platforms, including the case of several simulated boxes on a platform connected to a central unstiffened cylinder were studied. It is shown that there is little change in the overall average platform vibration levels resulting from the addition of small boxes. The acceleration at the individual boxes is predicted from the spatial average unloaded platform level and the measured platform and box impedances. The predicted overall level is within about 2 dB of the measured level. Author (ESA)

N82-32785# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Civil Engineering.

FATIGUE RESISTANCE OF ADHESIVELY BONDED STRUCTURAL CONNECTIONS Final Report

Harry Nara and Dario Gasparini Nov. 1981 138 p refs Sponsored in part by Ohio Dept. of Transportation, Columbus
(PB82-163189; FHWA/OH-81/011; Rept-45K1-114) Avail: NTIS HC A07/MF A01 CSCL 13B

Certain welded details adversely affect the fatigue life of bridge members. The utility and feasibility of steel to steel adhesive bonded connections as substitutes for such details is evaluated. Large scale fatigue tests indicated that adhesive can perform structural functions equal to those of welds without decreasing the fatigue life of beams. Representative adhesive connections on bridges and their performance criteria are broadly defined. Available structural adhesives which satisfy the design criteria are examined. Modified epoxies and acrylics are the structural adhesives most promising for bridge applications. Alternate adhesive constitutive equations and bond strength theories are reviewed. Design procedures and experience which may be pertinent for the design of connections on bridges are summarized. GRA

N82-32528# Mechanical Technology, Inc., Latham, N. Y.

SUBSYNCHRONOUS VIBRATIONS OF ROTOR SYSTEMS

S. B. Malanoski *In* Shock and Vibration Information Center The Shock and Vibration Digest, Vol. 14, No. 3 Mar. 1982 p 15-21 refs (For primary document see N82-32525 23-31)
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 20/11

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N82-32786*# Lille Univ. (France). Lab. d'Optique Atmospherique.

SEA SURFACE TEMPERATURE OF THE COASTAL ZONES OF FRANCE Final Report

P. Y. Deschamps, M. Crepon (Museum d'Histoire Naturelle, Paris), J. M. Monget (Ecole des Mines, Valbonne, France), F. Verger, Principal Investigators (Ecole Normale Superieure), R. Frouin, J. Cassanet ,(Ecole Normale Superieure), and L. Wald (Ecole des Mines, Valbonne, France) Jun. 1982 196 p refs Sponsored by NASA Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National Space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM
(E82-10364; NASA-CR-169162; NAS 1.26:169162) Avail: NTIS HC A09/MF A01 CSCL 08B

Thermal gradients in French coastal zones for the period of one year were mapped in order to enable a coherent study of certain oceanic features detectable by the variations in the sea surface temperature field and their evolution in time. The phenomena examined were mesoscale thermal features in the English Channel, the Bay of Biscay, and the northwestern Mediterranean; thermal gradients generated by French estuary systems; and diurnal heating in the sea surface layer. The investigation was based on Heat Capacity Mapping Mission imagery. J.D.

N82-32787*# National Aeronautics and Space Administration. Earth Resources Labs., Bay St. Louis, Miss.

ANALYSIS OF THEMATIC MAPPER SIMULATOR DATA COLLECTED OVER EASTERN NORTH DAKOTA

J. E. Anderson, Principal Investigator Apr. 1982 27 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Original contains color illustrations ERTS
(Proj. AgRISTARS)
(E82-10365; NASA-TM-84838; DC-Y1-04232; NSTL/ERL-204; NAS 1.15:84838) Avail: NTIS HC A03/MF A01 CSCL 02C

The results of the analysis of aircraft-acquired thematic mapper simulator (TMS) data, collected to investigate the utility of thematic mapper data in crop area and land cover estimates, are discussed. Results of the analysis indicate that the seven-channel TMS data are capable of delineating the 13 crop types included in the study to an overall pixel classification accuracy of 80.97% correct, with relative efficiencies for four crop types examined between 1.62 and 26.61. Both supervised and unsupervised spectral signature development techniques were evaluated. The unsupervised methods proved to be inferior (based on analysis of variance) for the majority of crop types considered. Given the ground truth data set used for spectral signature development as well as evaluation of performance, it is possible to demonstrate which signature development technique would produce the highest percent correct classification for each crop type. M.G.

N82-32788*# Kentron International, Inc., Hampton, Va.

DETERMINATION OF TURBIDITY PATTERNS IN LAKE CHICOT

FROM LANDSAT MSS IMAGERY
Stuart R. LeCroy, Principal Investigator Jan. 1982 52 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS
(Contract NAS1-16000; Proj. AgRISTARS)
(E82-10366; NASA-CR-167616; CP-32-04237; NAS 1.26:167616; V-19100/2Ltr-020) Avail: NTIS HC A04/MF A01 CSCL 02C

A historical analysis of all the applicable LANDSAT imagery was conducted on the turbidity patterns of Lake Chicot, located in the southeastern corner of Arkansas. By examining the seasonal and regional turbidity patterns, a record of sediment dynamics and possible disposition can be obtained. Sketches were generated from the suitable imagery, displaying different intensities of brightness observed in bands 5 and 7 of LANDSAT's multispectral scanner data. Differences in and between bands 5 and 7 indicate variances in the levels of surface sediment concentrations. High sediment loads are revealed when distinct patterns appear in the band 7 imagery. Additionally, the upwelled signal is exponential in nature and saturates in band 5 at low wavelengths for large concentrations of suspended solids. M.G.

N82-32789*# Agricultural Research Service, Mississippi State, Miss.
WINTER WHEAT: A MODEL FOR THE SIMULATION OF GROWTH AND YIELD IN WINTER WHEAT
D. N. Baker, D. E. Smika, A. L. Black, W. O. Willis, and Armand Bauer, Principal Investigators 24 Aug. 1981 165 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E82-10367; NASA-CR-169164; YM-U2-04281; JSC-18229; NAS 1.26:169164) Avail: NTIS HC A08/MF A01 CSCL 02C

The basic ideas and constructs for a general physical/physiological process level winter wheat simulation model are documented. It is a materials balance model which calculates daily increments of photosynthate production and respiratory losses in the crop canopy. The partitioning of the resulting dry matter to the active growing tissues in the plant each day, transpiration and the uptake of nitrogen from the soil profile are simulated. It incorporates the RHIZOS model which simulates, in two dimensions, the movement of water, roots, and soluble nutrients through the soil profile. It records the time of initiation of each of the plant organs. These phenological events are calculated from temperature functions with delays resulting from physiological stress. Stress is defined mathematically as an imbalance in the metabolite supply; demand ratio. Physiological stress is also the basis for the calculation of rates of tiller and floret abortion. Thus, tillering and head differentiation are modeled as the resulants of the two processes, morphogenesis and abortion, which may be occurring simultaneously. Author

N82-32790*# Environmental Research Inst. of Michigan, Ann Arbor. Applications Div.
DATA BASE MANIPULATION FOR ASSESSMENT OF MULTI-RESOURCE SUITABILITY AND LAND CHANGE Final Report, Feb. - Sep. 1981
J. Colwell, P. Sanders, G. Davis, and F. Thomson, Principal Investigators 30 Sep. 1981 130 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS
(Proj. AgRISTARS)
(E82-10368; NASA-CR-167645; RR-E2-04293; NAS 1.26:167645; ERIM-15400-1-F; NFAP-234) Avail: NTIS HC A07/MF A01 CSCL 02C

Progress is reported in three tasks which support the overall objectives of renewable resources inventory task of the AgRISTARS program. In the first task, the geometric correction algorithms of the Master Data Processor were investigated to determine the utility of data corrected by this processor for U.S. Forest Service uses. The second task involved investigation of logic to form blobs as a precursor step to automatic change detection involving two dates of LANDSAT data. Some routine procedures for selecting BLOB (spatial averaging) parameters were developed. In the third task, a major effort was made to develop land suitability modeling approches for timber, grazing, and wildlife habitat in support of resource planning efforts on the San Juan National Forest. M.G.

N82-32791*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
COMPARISON OF STORM-TIME CHANGES OF GEOMAGNETIC FIELD AT GROUND AND AT MAGSAT ALTITUDES, PART 3
Nelson deJesusParada, Principal Investigator, Rajaram Purushottam Kane, and Nalin Babulal Trivedi Sep. 1982 54 p refs Sponsored by NASA ERTS
(E82-10369; NASA-CR-169316; NAS 1.26:169316; INPE-2523-RPE/415) Avail: NTIS HC A04/MF A01 CSCL 04A

The latitudinal distributions of delta H, delta X, delta Y, and delta Z were studied for quiet and disturbed periods. For quiet periods, the average patterns showed some variations common to dusk and dawn, thus indicating probable ground anomaly. However, there were significant differences too between dusk and dawn, indicating considerable diurnal variation effects. Particularly in delta Y, these effects were large and were symmetric about the dip equator. For disturbed day passes, the quiet day patterns were considered as base levels and the latter were subtracted from the former. The resulting residual latitudinal patterns were, on the average, symmetric about the geographical equator. However, individual passes showed considerable north-south asymmetries, probably indicating meanderings of the central plane of the magnetospheric ring current. M.G.

N82-32792*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
A COMPARISON OF SOIL MOISTURE CHARACTERISTICS PREDICTED BY THE ARYA-PARIS MODEL WITH LABORATORY-MEASURED DATA
L. M. Arya, J. C. Richter, and S. A. Davidson, Principal Investigators Mar. 1982 398 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10370; NASA-CR-167617; SM-L2-04247; JSC-17820; NAS 1.26:167617; LEMSCO-17817) Avail: NTIS HC A17/MF A01 CSCL 02C

Soil moisture characteristics predicted by the Arya-Paris model were compared with the laboratory measured data for 181 New Jersey soil horizons. For a number of soil horizons, the predicted and the measured moisture characteristic curves are almost coincident; for a large number of other horizons, despite some disparity, their shapes are strikingly similar. Uncertainties in the model input and laboratory measurement of the moisture characteristic are indicated, and recommendations for additional experimentation and testing are made. M.G.

N82-32793*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
RESEARCH IN SATELLITE-AIDED CROP INVENTORY AND MONITORING
Jon D. Erickson, James L. Dragg, Robert M. Bizzell, and Milton C. Trichel, Principal Investigators Jul. 1982 11 p refs Presented at the 8th Intern. Symp. on Machine Process. of Remotely Sensed Data, West Lafayette, Ind., 7-9 Jul. 1982 Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E82-10371; NASA-TM-84839; IT-J2-04282; JSC-18231; NAS 1.15:84839) Avail: NTIS HC A02/MF A01 CSCL 02C

Automated information extraction procedures for analysis of multitemporal LANDSAT data in non-U.S. crop inventory and monitoring are reviewed. Experiments to develope and evaluate crop area estimation technologies for spring small grains, summer crops, corn, and soybeans are discussed. M.G.

N82-32794*# Elogic, Inc., Houston, Tex.
AGRISTARS. SUPPORTING RESEARCH: ALGORITHMS FOR SCENE MODELLING
M. E. Rassbach, Principal Investigator 30 Mar. 1982 55 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and agency for International Development ERTS
(Contract NAS9-16446; Proj. AgRISTARS)
(E82-10372; NASA-CR-167618; SR-X2-04260; NAS 1.26:167618; NAS-811) Avail: NTIS HC A04/MF A01 CSCL 02C

The requirements for a comprehensive analysis of LANDSAT or other visual data scenes are defined. The development of a general model of a scene and a computer algorithm for finding the particular model for a given scene is discussed. The modelling system includes a boundary analysis subsystem, which detects all the boundaries and lines in the image and builds a boundary graph; a continuous variation analysis subsystem, which finds gradual variations not well approximated by a boundary structure; and a miscellaneous features analysis, which includes texture, line parallelism, etc. The noise reduction capabilities of this method and its use in image rectification and registration are discussed. M.G.

N82-32795*# Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.
HCMM HYDROLOGICAL ANALYSIS IN UTAH Quarterly Progress Report
[1982] 17 p refs Sponsored by NASA Original contains color imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to "Attn: National Space Science Data Center"; non-domestic users send orders to "Attn: World Data Center A for Rockets and Satellites". HCMM
(E82-10373; NASA-CR-169168; NAS 1.26:169168; QPR-1) Avail: NTIS HC A02/MF A01 CSCL 08H

Data reduction and preliminary comparisons and correlations of Heat Capacity Mapping Mission data to ground truth measurements were made. The data covered Utah Lake and the surrounding area. Output modes include a digital hard copy record of the intensity value for each pixel and color graphics. Analyses of non-diatom net plankton (algae), turbidity, nitrogen, phosphorus, and temperatures were made. In addition, infrared data for the agricultural area around Utah lake were also preliminarily examined and compared to depth to groundwater data. M.G.

N82-32796*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
COMPUTER SIMULATION OF A SPACE SAR USING A RANGE-SEQUENTIAL PROCESSOR FOR SOIL MOISTURE MAPPING
Masaharu Fujita and Fawwaz Ulaby, Principal Investigators Apr. 1982 109 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-16419; Proj. AgRISTARS)
(E82-10374; NASA-CR-167619; SM-K2-04284; NAS 1.26:167619; RSL-TR-551-1) Avail: NTIS HC A06/MF A01 CSCL 02C

The ability of a spaceborne synthetic aperture radar (SAR) to detect soil moisture was evaluated by means of a computer simulation technique. The computer simulation package includes coherent processin of the SAR data using a range-sequential processor, which can be set up through hardware implementations, thereby reducing the amount of telemetry involved. With such a processing approach, it is possible to monitor the earth's surface on a continuous basis, since data storage requirements can be easily met through the use of currently available technology. The Development of the simulation package is described, followed by an examination of the application of the technique to actual environments. The results indicate that in estimating soil moisture content with a four-look processor, the difference between the assumed and estimated values of soil moisture is within + or - 20% of field capacity for 62% of the pixels for agricultural terrain and for 53% of the pixels for hilly terrain. The estimation accuracy for soil moisture may be improved by reducing the effect of fading through non-coherent averaging. M.G.

N82-32797*# Texas A&M Univ., College Station. Inst. of Statistics.
INCORPORATING PARTIALLY IDENTIFIED SAMPLE SEGMENTS INTO ACREAGE ESTIMATION PROCEDURES: ESTIMATES USING ONLY OBSERVATIONS FROM THE CURRENT YEAR
Robert L. Sielken, Jr., Principal Investigator Dec. 1981 77 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E82-10375; NASA-CR-169169; FC-T2-04254; NAS 1.26:169169; TR-21) Avail: NTIS HC A05/MF A01 CSCL 02C

Several methods of estimating individual crop acreages using a mixture of completely identified and partially identified (generic) segments from a single growing year are derived and discussed. A small Monte Carlo study of eight estimators is presented. The relative empirical behavior of these estimators is discussed as are the effects of segment sample size and amount of partial identification. The principle recommendations are (1) to not exclude, but rather incorporate partially identified sample segments into the estimation procedure, (2) try to avoid having a large percentage (say 80%) of only partially identified segments, in the sample, and (3) use the maximum likelihood estimator although the weighted least squares estimator and least squares ratio estimator both perform almost as well. Sets of spring small grains (North Dakota) data were used. M.G.

N82-32798*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A PARAMETRIC STUDY OF TILLAGE EFFECTS ON RADAR BACKSCATTER
Richard G. Fenner, Gerald F. Pels, and Stephen C. Reid, Principal Investigators Oct. 1980 34 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Prepared in cooperation with Lockheed Engineering and Management Services Co., Inc., Houston, Tex. ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10376; NASA-TM-84852; SM-J0-00470; JSC-16372; NAS 1.15:84852) Avail: NTIS HC A03/MF A01 CSCL 20N

Radar backscatter data for different field configurations and modulation function curves for angular and frequency variations are presented. A simplistic approach to modeling this effect is presented. It is concluded that: (1) row direction is a significant contributor to radar backscatter from cropland and must be considered when making radar measurements over bare or sparsely vegetated fields; (2) while the effect decrease with increasing frequency, it is still large (5 dB) at 13.3 GHz; (3) row effects are independent of linear polarization; (4) there is a strong aspect angle sensiiivity which is a function of the scene and radar system parameters. M.G.

N82-32799*# Science and Education Administration, College Station, Tex. Pest Congrol Equipment and Methods Research Unit.
PREDICTING THE TIMING AND POTENTIAL OF THE SPRING EMERGENCE OF OVERWINTERED POPULATIONS OF HELIOTHIS SPP Final Report, 1 Oct. 1980 - 31 Mar. 1981
Albert W. Hartstack, John A. Witz, and Juan D. Lopez, Principal Investigators 31 Mar. 1981 36 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(NASA Order T-4629-H; Proj. AgRISTARS)
(E82-10377; NASA-CR-167444; ; EW-U1-04185; NAS 1.26:167444) Avail: NTIS HC A03/MF A01 CSCL 02B

The current state of knowledge dealing with the prediction of the overwintering population and spring emergence of Heliothis spp., a serious pest of numerous crops is surveyed. Current literature is reviewed in detail. Temperature and day length are the primary factors which program H. spp. larva for possible diapause. Although studies on the interaction of temperature and day length are reported, the complete diapause induction process is not identified sufficiently to allow accurate prediction of diapause

timing. Mortality during diapause is reported as highly variable. The factors causing mortality are identified, but only a few are quantified. The spring emergence of overwintering H. spp. adults and mathematical models which predict the timing of emergence are reviewed. Timing predictions compare favorably to observed field data; however, prediction of actual numbers of emerging moths is not possible. The potential for use of spring emergence predictions in pest management applications, as an early warning of potential crop damage, are excellent. Research requirements to develop such an early warning system are discussed. J.D.

N82-32800*# Columbia Univ., New York. Dept. of Geography.
APPLICATION OF DIGITAL ANALYSIS OF MSS DATA TO AGRO-ENVIRONMENTAL STUDIES Semiannual Progress Report, 1 Jan. - 31 Dec. 1981
Robert A. Lewis and Samuel N. Goward, Principal Investigators 31 Dec. 1981 99 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS
(Contract NCC5-20)
(E82-10378; NASA-CR-169170; NAS 1.26:169170) Avail: NTIS HC A05/MF A01 CSCL 02C

Progress in the application of digital analysis of multispectral scanner data to agro-environmental studies is described. Simulation of LANDSAT D thematic mapper (TM) observations from aircraft multispectral scanner data and field spectrometer data collected over a corn-soybean agricultural region in Webster County, Iowa during the 1979 growing season in support of the NASA/AgRISTARS program is described. The simulations were analyzed to evaluate the potential utility of the TM (1.55-1.75 micron) mid-infrared observations in corn-soybean discrimination. Current LANDSAT data was analyzed to study snow cover in northern New England and wetlands in Nebraska and Vermont. The application of satellite remote sensor data in additional environmental research areas is described. J.D.

N82-32801*# National Park Service, Homestead, Fla. Everglades National Park.
AN APPLICATION OF LANDSAT MULTISPECTRAL IMAGERY FOR THE CLASSIFICATION OF HYDROBIOLOGICAL SYSTEMS, SHARK RIVER SLOUGH, EVERGLADES NATIONAL PARK, FLORIDA
Paul W. Rose and Peter C. Rosendahl, Principal Investigator 1979 106 p refs Sponsored by NASA ERTS
(E82-10379; NASA-CR-169171; NAS 1.26:169171; T-544) Avail: NTIS HC A06/MF A01 CSCL 05B

Multivariant hydrologic parameters over the Shark River Slough were investigated. Ground truth was established utilizing U-2 infrared photography and comprehensive field data to define a control network which represented all hydrobiological systems in the slough. These data were then applied to LANDSAT imagery utilizing an interactive multispectral processor which generated hydrographic maps through classification of the slough and defined the multispectral surface radiance characteristics of the wetlands areas in the park. The spectral response of each hydrobiological zone was determined and plotted to formulate multispectral relationships between the emittent energy from the slough in order to determine the best possible multispectral wavelength combinations to enhance classification results. The extent of each hydrobiological zone in slough was determined and flow vectors for water movement throughout the slough established. J.D.

N82-32802*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
REMOTE SENSING AND POTENTIAL APPLICATION OF LANDSAT IMAGERY TO AGRICULTURAL RESOURCES
Nelson deJesusParada, Principal Investigator and Ilunga Nday Feb. 1982 72 p refs Sponsored by NASA ERTS
(E82-10380; NASA-CR-169321; NAS 1.26:169321; INPE-2324-RPE/403) Avail: NTIS HC A04/MF A01 CSCL 02C

The theory and application of remote sensing is reviewed with particular emphasis on the LANDSAT system. Main topics refer to the physical principles of remote sensing and visual/automatic analysis of LANDSAT data applied to natural resources surveying and monitoring. Case studies regarding remote sensing applications in forestry, soil mapping, land use, morphometric analysis, geomorphology, range management and assessment are discussed. Conclusive remarks appoint LANDSAT as a improving tool to overcome the lack of basic information related to natural resources inventory. M.G.

N82-32803*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
LARSPEC SPECTRORADIOMETER-MULTIBAND RADIOMETER DATA FORMATS
Larry L. Biehl May 1982 53 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contracts NAS9-16528; NAS9-15466; Proj. AgRISTARS)
(E82-10381; NASA-CR-167647; SR-P2-04277; NAS 1.26:167647; LARS-050182) Avail: NTIS HC A04/MF A01 CSCL 02C

The data base software system, LARSPEC, is discussed and the data base format for agronomic, meteorological, spectroradiometer, and multiband radiometer data is described. In addition, the contents and formats of each record of data and the wavelength tables are listed and the codes used for some of the parameters are described. M.G.

N82-32804*# Geological Survey, Denver, Colo.
APPLICATION OF HCMM DATA TO REGIONAL GEOLOGIC ANALYSIS FOR MINERAL AND ENERGY RESOURCE EVALUATION Progress Report, Dec. 1981 - Jun. 1982
Kenneth Watson, Principal Investigator and Susanne H. Miller Jun. 1982 4 p Sponsored by NASA HCMM
(E82-10382; NASA-CR-169173; NAS 1.26:169173) Avail: NTIS HC A02/MF A01 CSCL 08G

Using a thermal-inertia mapping algorithm which provides greater discrimination capability than those in current use, a geologic features was detected in the Cabeza Prieta, Arizona, area. Initially seen on an image formed as a difference of two thermal-inertia images, it was found to be the extension of a bilaterally symmetrical aeromagnetic feature which trends northeast for a distance of at least 1200 km. M.G.

N82-32805*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
PERFORMANCE EVALUATION AND CALIBRATION OF A MODULAR MULTIBAND RADIOMETER FOR REMOTE SENSING FIELD RESEARCH
B. F. Robinson, R. E. Buckley (Barnes Engineering Co., Stamford, Conn.), and J. A. Burgess, Principal Investigators (Barnes Engineering Co., Stamford, Conn.) Jun. 1982 15 p refs Repr. from SPIE, v. 308, Contemp. Infrared Standards and Calibration, 1981 p 146-157 Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15466; Proj. AgRISTARS)
(E82-10388; NASA-CR-167710; SR-P2-04318; NAS 1.26:167710; LARS-061182) Avail: NTIS HC A02/MF A01 CSCL 02C

A multiband radiometer suitable for operation from helicopter, small plane, truck, or tripod platforms was developed. The standard unit is equipped with the seven thematic mapper spectral bands with an added band from 1.5 to 1.30 microns; however, up to eight user specified bands from 0.4 to 15 microns may be installed under clean field conditions. Results of prototype tests of the spectral responsivity of the detectors, the transmittance of the optical filters as a function of wavelength, the fields of view, and the system linarity, temperature stability, noise performance, and dynamic range were evaluated. Minor modifications were made to the instrument and the results of final testing are reported. M.G.

N82-32806*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
PRELIMINARY STUDY FOR CORRELATION OF METEOROLOGICAL SATELLITE (METSAT) DATA WITH LANDSAT DATA
J. L. Amery-Ryland, Principal Investigator Mar. 1982 39 p ref

Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10384; NASA-CR-167621; EW-L2-04248; JSC-17821; NAS 1.26:167621; LEMSCO-17307) Avail: NTIS HC A03/MF A01 CSCL 02C

A data set covering multiyear LANDSAT data correlated with meteorological satellite global area coverage (GAC) is defined. Procedures developed for viewing the METSAT GAS imagery and for geographically locating a Large Area Crop Inventory Experiment segment defined on LANDSAT imagery are described. M.G.

N82-32807*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
ESTIMATING ACREAGE BY DOUBLE SAMPLING USING LANDSAT DATA Technical Report, 15 Nov. 1980 - 14 Nov. 1981
F. Pont, H. Horwitz, and R. Kauth, Principal Investigators Jan. 1982 36 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15476; Proj. AgRISTARS)
(E82-10385; NASA-CR-167622; IT-E2-04246; NAS 1.26:167622; ERIM-152400-22-T) Avail: NTIS HC A03/MF A01 CSCL 02C

Double sampling techniques employing LANDSAT data for estimating the acreage of corn and soybeans was investigated and evaluated. The evaluation was based on estimated costs and correlations between two existing procedures having differing cost/variance characteristics, and included consideration of their individual merits when coupled with a fictional 'perfect' procedure of zero bias and variance. Two features of the analysis are: (1) the simultaneous estimation of two or more crops; and (2) the imposition of linear cost constraints among two or more types of resource. A reasonably realistic operational scenario was postulated. The costs were estimated from current experience with the measurement procedures involved, and the correlations were estimated from a set of 39 LACIE-type sample segments located in the U.S. Corn Belt. For a fixed variance of the estimate, double sampling with the two existing LANDSAT measurement procedures can result in a 25% or 50% cost reduction. Double sampling which included the fictional perfect procedure results in a more cost effective combination when it is used with the lower cost/higher variance representative of the existing procedures. M.G.

N82-32808*# Brown Univ., Providence, R. I. Dept. of Geological Sciences.
ELECTROMAGNETIC DEEP-PROBING (100-1000 KMS) OF THE EARTH'S INTERIOR FROM ARTIFICIAL SATELLITE: CONSTRAINTS ON THE REGIONAL EMPLACEMENT OF CRUSTAL RESOURCES Quarterly Progress Report, 1 Jan. - 30 Jun. 1982
John F. Hermance, Principal Investigator 30 Jun. 1982 28 p refs ERTS
(Contract NAS5-26138)
(E82-10386; NASA-CR-169175; NAS 1.26:169175; QPR-7; QPR-8) Avail: NTIS HC A03/MF A01 CSCL 08G

The two stages of analysis of MAGSAT magnetic data which are designed to evaluate electromagnetic induction effects are described. The first stage consists of comparison of data from contiguous orbit passes over large scale geologic boundaries, such as ocean-land interfaces, at several levels of magnetic disturbance. The purpose of these comparisons is to separate induction effects from effects of lithospheric magnetization. The procedure for reducing the data includes: (1) identifying and subtracting quiet time effects; (2) modelling and subtracting first order ring current effects; and (3) projecting an orbit track onto a map as a nearly straight line so it can serve as an axis on which to plot the corresponding orbit pass data in the context of geography. The second stage consists of comparison of MAGSAT data with standard hourly observatory data. The purpose is to constrain the time evolution of ionospheric and magnetospheric current systems. Qualitative features of the ground based dataset are discussed. Methods for reducing the ground based data are described. M.G.

N82-32809*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
ADVANCED VERY HIGH RESOLUTION RADIOMETER (AVHRR) DATA EVALUATION FOR USE IN MONITORING VEGETATION. VOLUME 1: CHANNELS 1 AND 2
N. C. Horvath, T. I. Gray, and D. G. McCrary, Principal Investigators May 1982 89 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Prepared in cooperation with NOAA, Houston, Tex. ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10387; NASA-CR-167640; EW-L2-04303; JSC-18243; NAS 1.26:167640; LEMSCO-17383) Avail: NTIS HC A05/MF A01 CSCL 02C

Data from the National Oceanic and Atmospheric Administration satellite system (NOAA-6 satellite) were analyzed to study their nonmeteorological uses. A file of charts, graphs, and tables was created form the products generated. It was found that the most useful data lie between pixel numbers 400 and 2000 on a given scan line. The analysis of the generated products indicates that the Gray-McCrary Index can discern vegetation and associated daily and seasonal changes. The solar zenith-angle correction used in previous studies was found to be a useful adjustment to the index. The METSAT system seems best suited for providing large-area analyses of surface features on a daily basis. M.G.

N82-32810*# Texas Univ. at Dallas, Richardson. Center for Space Sciences.
INVESTIGATION OF THE EFFECTS OF EXTERNAL CURRENT SYSTEMS ON THE MAGSAT DATA UTILIZING GRID CELL MODELING TECHNIQUES Quarterly Status Technical Progress Report, 1 Apr. - 30 Jun. 1982
David M. Klumpar, Principal Investigator 1 Jul. 1982 9 p refs ERTS
(Contract NAS5-26309)
(E82-10388; NASA-CR-169177; NAS 1.26:169177; UTD-E0533-01; QSTPR-7) Avail: NTIS HC A02/MF A01 CSCL 05B

The status of the initial testing of the modeling procedure developed to compute the magnetic fields at satellite orbit due to current distributions in the ionosphere and magnetosphere is reported. The modeling technique utilizes a linear current element representation of the large scale space-current system. M.G.

N82-32811*# Colorado Univ., Boulder. Dept. of AstroGeophysics.
INVESTIGATION OF GEOMAGNETIC FIELD FORECASTING AND FLUID DYNAMICS OF THE CORE Quarterly Status Technical Progress Report, 1 Apr. - 30 Jun. 1982
Edward R. Benton, Principal Investigator 1 Jul. 1982 5 p ERTS
(Contract NAS5-25957)
(E82-10389; NASA-CR-169178; NAS 1.26:169178; QSTPR-10) Avail: NTIS HC A02/MF A01 CSCL 08G

Progress in the development, testing, and evaluation of kinematic geomagnetic forecast models and their utility in magnetic prediction of the core-mantle boundary of the Earth and in determination of the core radius is reported. The GFSC 9/80 model, which uses MAGSAT data, was determined to be of high quality. J.D.

N82-32812*# Institute of Geological Sciences, London (England).
SPHERICAL HARMONIC REPRESENTATION OF THE MAIN GEOMAGNETIC FIELD FOR WORLD CHARTING AND INVESTIGATIONS OF SOME FUNDAMENTAL PROBLEMS OF PHYSICS AND GEOPHYSICS Progress Report
D. R. Barraclough, R. Hide (Meteorological Office), B. R. Leaton, F. J. Lowes (Newcastle-upon-Tyne Univ.), S. R. C. Malin, and R. L. Wilson, Principal Investigators (Liverpool Univ.) 1 Jun. 1982 3 p Sponsored by NASA ERTS
(E82-10390; NASA-CR-169179; NAS 1.26:169179) Avail: NTIS HC A03/MF A01 CSCL 08G

Progress in the harmonic analysis of MAGSAT data is reported. Single-day data sets were subdivided into information on the sunrise

side of the Earth and information on the sunset side of the Earth. Data for the main and external fields each demonstrate a clear and consistent systematic difference between the sets of data which was determined to be, due to ionospheric currents which differ from the sunset to the sunrise terminator. A toroidal field was analyzed for and determined to be an apparent toroidal field resulting from electric currents concentrated in the two terminators. Progressive elimination of auroral zone data demonstrates that the information presented does not arise from complications due to Birkeland currents. J.D.

N82-32813*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

SPATIAL AND SPECTRAL SIMULATION OF LANDSAT IMAGES OF AGRICULTURAL AREAS

W. F. Pont, Jr., Principal Investigator Mar. 1982 29 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(Contract NAS9-15476; Proj. AgRISTARS)

(E82-10391; NASA-CR-167639; SR-E1-04206; NAS 1.26:167639; ERIM-152400-18-T) Avail: NTIS HC A03/MF A01 CSCL 02C

A LANDSAT scene simulation capability was developed to study the effects of small fields and misregistration on LANDSAT-based crop proportion estimation procedures. The simulation employs a pattern of ground polygons each with a crop ID, planting date, and scale factor. Historical greenness/brightness crop development profiles generate the mean signal values for each polygon. Historical within-field covariances add texture to pixels in each polygon. The planting dates and scale factors create between-field/within-crop variation. Between field and crop variation is achieved by the above and crop profile differences. The LANDSAT point spread function is used to add correlation between nearby pixels. The next effect of the point spread function is to blur the image. Mixed pixels and misregistration are also simulated. M.G.

N82-32814*# Bern Univ. (Switzerland). Dept. of Geography.

TOPOCLIMATOLOGICAL SURVEY OF SWITZERLAND Final Report

Matthias Winiger, Principal Investigator May 1982 39 p refs Sponsored by NASA HCMM

(E82-10392; NASA-CR-169181; NAS 1.26:169181) Avail: NTIS HC A03/MF A01 CSCL 08B

The application of Heat Capacity Mapping Mission data to subsynoptic climate analysis of Switzerland was examined. The data included the surface temperature distributions of urban heat islands and the Swiss Alps. Analog and digital data evaluation procedures are described as well as the ground truth acquisition and comparison program. The dependence of the temperature distributions on topography and surface coverage types is assessed. The results indicate that air temperature inversion zones are detectable. M.G.

N82-32815*# Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.

DELINEATION OF SOIL TEMPERATURE REGIMES FROM HCMM DATA Quarterly Report

Rick L. Day and Gary W. Petersen, Principal Investigators 30 Jun. 1982 3 p Sponsored by NASA HCMM

(E82-10393; NASA-CR-169182; NAS 1.26:169182) Avail: NTIS HC A02/MF A01 CSCL 08M

Average daily temperatures (ADT) were calculated for five Heat Capacity Mapping Mission scenes by averaging raw daytime temperature and nighttime temperature values using the SUBTRAN program. Mean annual soil temperatures (MAST) were calculated using ADT as input into a linearized one-dimensional heat flow equation describing the theoretical temperature response curve at the Earth's surface. The annual amplitude (AMP) of the response curve was also calculated. Finally, versatec plots of MAST and AMP were generated showing their spatial distribution. M.G.

N82-32816*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

SOYBEAN CANOPY REFLECTANCE AS A FUNCTION OF VIEW AND ILLUMINATION GEOMETRY

M. E. Bauer, Principal Investigator, K. J. Ranson, V. C. Vanderbilt, L. L. Biehl, and B. F. Robinson Apr. 1982 16 p refs Presented at the 15th Intern. Symp. on Remote Sensing of Environ., Ann Arbor, Mich., May 1981 Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15466; Proj. AgRISTARS)

(E82-10394; NASA-CR-167644; SR-P2-04278; NAS 1.26:167644; LARS-042182) Avail: NTIS HC A02/MF A01 CSCL 02C

The results of an experiment designed to characterize a soybean field by its reflectance at various view and illumination angles and by its physical and agronomic attributes are presented. Reflectances were calculated from measurements at four wavelength bands through eight view azimuth and seven view zenith directions for various solar zenith and azimuth angles during portions of three days. An ancillary data set consisting of the agronomic and physical characteristics of the soybean field is described. The results indicate that the distribution of reflectance from a soybean field is a function of the solar illumination and viewing geometry, wavelength and row direction, as well as the state of development of the canopy. Shadows between rows greatly affected the reflectance in the visible wavelength bands and to a lesser extent in the near infrared wavelengths. A model is proposed that describes the reflectance variation as a function of projected solar and projected viewing angles. The model appears to approximate the reflectance variations in the visible wavelength bands from a canopy with well defined row structure. M.G.

N82-32817*# Iowa Univ., Iowa City. Dept. of Geology.

USE OF MAGSAT ANOMALY DATA FOR CRUSTAL STRUCTURE AND MINERAL RESOURCES IN THE US MIDCONTINENT Quarterly Report, period ending 30 Jun. 1982

Robert S. Carmichael, Principal Investigator and Ross Black 22 Jun. 1982 8 p ERTS

(Contract NAS5-26425)

(E82-10395; NASA-CR-169184; NAS 1.26:169184; QR-6) Avail: NTIS HC A02/MF A01 CSCL 08G

Activities concerning the interpretation of processed MAGSAT data and maps are briefly reported. Work involving the identification of long wavelength 'regional' effects that might be associated with varying crustal thickness or Curie temperature depths is processing. M.G.

N82-32818*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

CHARACTERISTIC VARIATIONS IN REFLECTANCE OF SURFACE SOILS

E. R. Stoner and M. F. Baumgardner, Principal Investigators May 1982 8 p refs Repr. from Soil Sci. Soc. Am. J., vol. 45, no. 6, Nov. - Dec. 1981 p 1161-1165 Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS

(Contract NAS9-15466; Proj. AgRISTARS)

(E82-10396; NASA-CR-169185; SR-P2-04301; NAS 1.26:169185; LARS-121881) Avail: NTIS HC A02/MF A01 CSCL 08M

Surface soil samples from a wide range of naturally occurring soils were obtained for the purpose of studying the characteristic variations in soil reflectance as these variations relate to other soil properties and soil classification. A total 485 soil samples from the U.S. and Brazil representing 30 suborders of the 10 orders of 'Soil Taxonomy' was examined. The spectral bidirectional reflectance factor was measured on uniformly moist soils over the 0.52 to 2.32 micron wavelength range with a spectroradiometer adapted for indoor use. Five distinct soil spectral reflectance curve forms were identified according to curve shape, the presence or absence of absorption bands, and the predominance of soil organic matter and iron oxide composition. These curve forms were further characterized according to generically homogeneous soil properties in a manner similar to the subdivisions at the suborder level of

'Soil Taxonomy'. Results indicate that spectroradiometric measurements of soil spectral bidirectional reflectance factor can be used to characterize soil reflectance in terms that are meaningful to soil classification, genesis, and survey. Author

N82-32819*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex. Systems and Services Div.
SOFTWARE FOR THE GROUPED OPTIMAL AGGREGATION TECHNIQUE
P. M. Brown and G. W. Shaw, Principal Investigators Feb. 1982 229 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS (Contract NAS9-15800; Proj. AgRISTARS)
(E82-10397; NASA-CR-167641; IT-L2-04304; JSC-18244; NAS 1.26:167641; LEMSCO-17755) Avail: NTIS HC A11/MF A01 CSCL 02C

The grouped optimal aggregation technique produces minimum variance, unbiased estimates of acreage and production for countries, zones (states), or any designated collection of acreage strata. It uses yield predictions, historical acreage information, and direct acreage estimate from satellite data. The acreage strata are grouped in such a way that the ratio model over historical acreage provides a smaller variance than if the model were applied to each individual stratum. An optimal weighting matrix based on historical acreages, provides the link between incomplete direct acreage estimates and the total, current acreage estimate. Author

N82-32820*# Joint Research Centre of the European Communities, Ispra (Italy).
HEAT CAPACITY MAPPING MISSION INVESTIGATION NO. 25 (TELLUS PROJECT) Final Report
Sergio Galli deParatesi, Principal Investigator and Peter Reiniger, ed. 1982 249 p refs Sponsored by NASA Original contains color imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM
(E82-10398; NASA-CR-169187; NAS 1.26:169187) Avail: NTIS HC A11/MF A01 CSCL 08B

The TELLUS pilot project, utilizing 0.5 to 1.1 micron and 10.5 to 12.5 micron day and/or night imagery from the Heat Capacity Mapping Mission, is described. The application of remotely sensed data to synoptic evaluation of evapotranspiration and moisture in agricultural soils was considered. The influence of topography, soils, land use, and meteorology on surface temperature distribution was evaluated. Anthropogenic heat release was investigated. Test areas extended from semi-arid land in southern Italy to polders in the Netherlands, and from vine-growing hills in the Rhineland to grasslands in Buckinghamshire. J.D.

N82-32821# Naval Surface Weapons Center, Dahlgren, Va.
SEASAT SATELLITE RADAR ALTIMETRY DATA PROCESSING SYSTEM
Gladys B. West May 1981 28 p refs
(NSWC-TR-234) Avail: NTIS HC A03/MF A01

Measurements from the SEASAT satellite radar altimeter are combined with the Doppler precise orbit, corrected for atmospheric and environmental effects, and reduced to along-track geoid heights and vertical deflections by an adaptive Kalman smoother, which is based upon a third-order Markov process. The altimeter data processing system at the Naval Surface Weapons Center is described. Author

N82-32822# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SOME EXPERIMENTS WITH SPATIAL FEATURE EXTRACTION METHODS IN MULTISPECTRAL CLASSIFICATION
Luciano V. Dutra and Nelson D. A. Mascarenhas Jun. 1982 26 p refs Submitted for publication
(INPE-2443-PRE/144) Avail: NTIS HC A03/MF A01

Methods are developed to extract image spatial features by means of linear and non-linear local filtering. Feature selection methods are also developed, since it is usually not possible to use all the generated features. The classification stage is performed in supervised mode through the maximum likelihood criterion. A quantitative analysis of the performance of the spatial features show that an overall increase in precision of classification is achieved, although at the expense of increased rejection levels, particularly on the borders between different fields. Author

N82-32823# Office of Naval Research, Pasadena, Calif.
ARABIAN SEA PROJECT OF 1980: COMPOSITES OF INFRARED IMAGES, SUPPLEMENT
Ben J. Cagle and Robert Whritner Dec. 1981 50 p
(AD-A116710; ONRWEST-81-5-Sup) Avail: NTIS HC A03/MF A01 CSCL 08/3

It became apparent, by feedback from the distribution of ONRWEST Report 81-5, that the composites of infrared images of the Arabian Sea should be reproduced in a larger size. The larger size permits some improvement in spatial details. Also, an effort has been made to improve the contrast in grey shades representing the ocean features, which were the subject of the original report. Figures 1 and 36 through 45 of ONRWEST Report 81-5 are reproduced herein. GRA

N82-32824# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Geotechnical Research Branch.
NUMERICAL SOLUTIONS FOR A RIGID-ICE MODEL OF SECONDARY FROST HEAVE
Kevin ONeill and Robert D. Miller Apr. 1982 17 p refs Sponsored in part by the Federal Highway Administration and the Federal Aviation Administration.
(Grant NSF ENG-77-17004)
(AD-A115597; CRREL-82-13) Avail: NTIS HC A02/MF A01 CSCL 08/12

Frost heave is analyzed for the common case in which some ice penetrates the soil. In this situation, heave is due to the accumulation of soil-free ice just within the frozen zone, behind a frozen fringe of finite thickness. Heat and mass transport within and across that fringe are crucial processes in the dynamics of heave. This analysis concentrates on activity within the fringe, also connecting that activity to heat and mass flows in the more frozen and unfrozen zones. Each component in a set of governing differential equations is developed from rational physics and thermodynamics, using previous experimental work. It is assumed that the soil ice grows through interconnected interstices; hence it constitutes and can move as a rigid body. When the assumption is translated into mathematical terms, it completes the governing equations. The model resulting from these considerations is a one-dimensional finite element computer program that solves the equations for arbitrary initial and boundary conditions. The model is used to simulate the heave history of a hypothetical soil column frozen unidirectionally and subjected to a surcharge. The results are gratifying in that they predict qualitatively the characteristics of numerous laboratory observations. Some questions about the completeness of the theory remain, and strict verification of the model awaits further experimentation and better parameter identification. GRA

N82-32825# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
REMOTE SENSING OF GASES USING LIDAR RESONANCE SCATTERING TECHNIQUES FROM THE SPACE SHUTTLE M.S. Thesis
Glenn C. Kweder Oct. 1981 93 p refs
(AD-A115627; AFIT/GEP/PH/81D-5) Avail: NTIS HC A05/MF A01 CSCL 17/8

Remote sensing from the space shuttle utilizing laser-induced fluorescence techniques was investigated. A feasibility study of LIDAR (Light Detection and Ranging) techniques to detect twelve gases of scientific and military interest was carried out. Evaluation of a European Space Agency LIDAR hardware design was also a task. The main emphasis was on determination of background noise, spectral transitions, atmospheric transmission and molecular absorption cross-section of the target in order to determine

the minimum target concentration required to be detectable. Atomic sodium, molecular iodine and hydrogen fluoride were determined to be promising candidates for LIDAR resonance detection. Other molecules investigated, such as hydrogen chloride, xenon and krypton were considered marginally detectable at best because of their small absorption cross-sections. Lack of sufficient data prevented extended analysis of the remaining molecules.
Author (GRA)

N82-32826# Synectics Corp., Rome, N. Y.
ADVANCED CARTOGRAPHIC DATA DIGITIZING SYSTEM Final Technical Report, 1 Oct. 1979 - 28 Feb. 1982
Paul D. Bell, David A. Kolassa, and Joan A. Terenzetti Griffiss AFB, N.Y. RADC Apr. 1981 32 p
(Contract F30602-79-C-0261; AF Proj. 4303)
(AD-A115812; RADC-TR-81-102) Avail: NTIS HC A03/MF A01 CSCL 14/3

This report describes the Advanced Cartographic Data Digitizing system functional capabilities as a complete digital cartographic system. Topics from data digitizing through product generation including overall system description, hardware configuration, host processor software and workstation software are covered. In addition, the report describes avenues of system expansion if these are deemed appropriate by the Defense Mapping Agency.
Author (GRA)

N82-32827# New York Univ., New York. College of Environmental Science and Forestry.
ANGULAR EXTERIOR ORIENTATION OF AIRBORNE SENSORS Final Technical Report, 29 Dec. 1980 - 30 Sep. 1981
Robert H. Brock Griffiss AFB, N.Y. RADC Mar. 1982 52 p refs Prepared in cooperation with Southeastern Center for Electrical Engineering Education
(Contract F30602-78-C-0148; AF Proj. LD13)
(AD-A115846; RADC-TR-82-41) Avail: NTIS HC A04/MF A01 CSCL 08/2

The results of an investigation into the feasibility of a radar sensor independent method of dynamic calibration by a bore sighted metric camera are presented. Analytic aerotriangulation of oblique photographic imagery containing ground control provide an independent measurement of radar sensor bias errors. Error correction models are generated which provide position and angular corrections to the radar output to be applied in real time over random targets. Utilizing fictitious data, it was concluded that such calibration procedures can be successful and practical and indeed should be further developed. Author (GRA)

N82-32828# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
THE MOBILITY OF WATER IN FROZEN SOILS
Virgil J. Lunardini, Richard Berg, Richard McGaw, Thomas Jenkins, Yoshisuke Nakano, Joseph Oliphant, Kevin ONeill, and Allan Tice 18 Jun. 1982 15 p refs Presented at the Army Sci. Conf., 15-18 Jun. 1982
(AD-A117321) Avail: NTIS HC A02/MF A01 CSCL 08/13

New relations for the flow of water in partially frozen soils are now being incorporated into frost heave models. The thermodynamic equilibrium equations for freezing soil water are well established but the partition of the soil system stresses within freezing zones is poorly understood. It has been demonstrated that the hydraulic conductivity of water in frozen soils is small but non-zero. Over time spans of several years, which are appropriate for new large scale engineering projects in cold climates, water flow in frozen soils will be significant. The experimental work has shown that Darcy's law is valid for film water flow in ice-free frozen soils and is a reasonable approximation for frozen soil with ice if the ice pressure gradient is negligible. The capability of deriving the freezing-zone moisture characteristics for a frost-susceptible soil, demonstrated here, is important in the theoretical prediction of the amount of segregated ice in a freezing soil. GRA

N82-32829# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Analytical Chemistry Div.

GEOLOGY AND MINERAL RESOURCES OF THE JOHNSON CITY, PHENIX CITY, AND ROME 10 X 20 NTMS QUADRANGLES
Barbara S. Karfunkel, comp. Nov. 1981 96 p refs
(Contract DE-AC09-76SR-00001)
(DE82-011253; DPST-81-141-10) Avail: NTIS HC A05/MF A01

Geologic and mineral resources data for the Savannah River Laboratory are presented. The national uranium resource evaluation (NURE) hydrogeochemical and stream-sediment reports for the Johnson City, Phenix City, and Rome 10 x 20 National Topographic Map Series quadrangles in the southeastern United States are included. Background geologic and mineral resources information which aid in the interpretation of the NURE geochemical reconnaissance data are provided. DOE

N82-32830# California Dept. of Conservation, Sacramento. Div. of Oil and Gas.
RESERVOIR ASSESSMENT OF THE GEYSERS GEOTHERMAL FIELD
Richard P. Thomas, Rodger H. Chapman, and Herman Dykstra 1981 138 p
(Contract DE-FG03-79ET-27108)
(DE82-011700; DOE/ET-27108/T1; TR27) Avail: NTIS HC A07/MF A01

Big Sulphur Creek fault zone, in the geyers geothermal field, may be part of a deep seated, wrench style fault system. Hydrothermal fluid in the field reservoir may rise through conduits beneath the five main anomalies associated with the Big Sulphur Creek wrench trend. Some geophysical anomalies (electrical resistivity and audio magnetotelluric) evidently are caused by the hot water geothermal field or zones of altered rocks; others represent the underlying heat source, a possible magma chamber; and others (microearthquake activity) may be related to the steam reservoir. A large negative gravity anomaly and a few low resistivity anomalies suggest areas generally favorable for the presence of steam zones, but these anomalies apparently do not directly indicate the known steam reservoir. At the current generating capacity of 930 MWe, the estimated life of the geysers geothermal field reservoir is 129 years. The estimated reservoir life is 60 years for the anticipated maximum generating capacity of 2000 MWe as of 1990. Wells at the geysers are drilled with conventional drilling fluid (mud) until the top of the steam reservoir is reached; then, they are drilled with air. Usually, mud, temperature, caliper, dual induction, and cement bond logs are run on the wells. DOE

N82-32831# Oecon Raumfahrt Consulting G.m.b.H., Munich (West Germany).
ECONOMIC ASSESSMENT OF A EUROPEAN REMOTE SENSING SATELLITE SYSTEM FOR AGRICULTURAL APPLICATIONS: VOLUME 1: SUMMARY
J. Bodechtel (Tech. Univ., Munich), E. Bodechtel, F. Jaskolla (Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung), J. Henkel (Tech. Univ., Munich), Klaus P. Heiss (ECON, Princeton, New Jersey), Francis Sand (ECON, Princeton, New Jersey), Dean Farley (Princeton Univ.), David Lawson (ECON, Princeton, New Jersey), and Elissa Weiss (ECON, Princeton, New Jersey) Paris ESA 15 Jan. 1981 40 p refs 2 Vol.
(Contract ESA-4186/79/F(SC))
(ESA-CR(P)-1606-Vol-1) Avail: NTIS HC A03/MF A01

European Economic Community (EEC) benefits from remote sensing of wheat, corn and cereal crops were estimated by a model. Crop area classification accuracy was simulated using a variety of spectral bands, ground resolutions, field sizes, field orientations and spectral contrasts. Model output is the economic value of the difference between the improved and current crop information systems. The estimated net benefit is 166 to 337 million European Accounting Units (MAU) annually. The cost savings to the administration from improved efficiency are 57 to 295 MAU annually. The value of the improved crop information under free trade is 14.7 to 78.2 MAU to the EEC annually. The benefits must not be added, since each assumes a different set of economic conditions. Given 317 MAU nonrecurring development costs over

6 years and 37 MAU recurring annual operational costs, the benefit/cost ratio is 4.1 to 8.2 Author (ESA)

N82-32832# Oecon Raumfahrt Consulting G.m.b.H., Munich (West Germany).
ECONOMIC ASSESSMENT OF A EUROPEAN REMOTE SENSING SATELLITE SYSTEM FOR AGRICULTURAL APPLICATIONS: VOLUME 2: MAIN REPORT
J. Bodechtel (Tech. Univ., Munich), E. Bodechtel, F. Jaskolla (Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung), J. Henkel (Tech. Univ., Munich), Klaus P. Heiss (ECON, Princeton, New Jersey), Francis Sand (ECON, Princeton, New Jersey), Dean Farley (Princeton Univ.), David Lawson (ECON, Princeton, New Jersey), and Elissa Weiss (ECON, Princeton, New Jersey) Paris ESA 15 Jan. 1981 165 p refs 2 Vol.
(Contract ESA-4186/79/F(SC))
(ESA-CR(P)-1606-Vol-2) Avail: NTIS HC A08/MF A01

European Economic Community (EEC) benefits from remote sensing of wheat, corn and cereal crops were estimated by a model. Crop area classification accuracy was simulated using a variety of spectral bands, ground resolutions, field sizes, field orientations and spectral contrasts. Model output is the economic value of the difference between the improved and current crop information systems. The estimated net benefit is 166 to 337 million European Accounting Units (MAU) annually. The cost savings to the administration from improved efficiency are 57 to 295 MAU annually. The value of the improved crop information under free trade is 14.7 to 78.2 MAU to the EEC annually. The benefits must not be added since each assumes a different set of economic conditions. Given 317 MAU nonrecurring development costs over 6 years and 37 MAU recurring annual operational costs, the benefit/cost ratio is 4.1 to 8.2 Author (ESA)

N82-32833# Economic Research Service, Washington, D. C. Natural Resource Economics Div.
WATER QUALITY MONITORING AND MODELING WORKSHOP: PROCEEDINGS
William Crosswhite, ed. and James Meek, ed. (EPA, Washington, D.C.) Jun. 1982 244 p refs Proc. held at Washington, D.C., Jun. 1981 Sponsored in part by EPA
(PB82-168394; AGES-810506) Avail: NTIS HC A11/MF A01 CSCL 08H

The Proceedings examine the state-of-arts in water quality monitoring and modeling, the needs of user groups and the relationship between modeling and monitoring. The linkage between economic and water quality monitoring, modeling and evaluation is explored. A systems approach, utilizing models and monitoring, is presented as a useful tool in designing water quality control projects, determining pollution abatement effects, quantifying the impacts of alternative strategies and management systems and evaluating the effectiveness of pollution control measures.
Author (GRA)

N82-32834# National Oceanic and Atmospheric Administration, Rockville, Md. Office of Ocean Technology and Engineering Services.
AN ESTIMATE OF THE AREA SURVEYABLE WITH AN AIRBORNE LASER HYDROGRAPHY SYSTEM AT TEN US SITES
David B. Enabnit, Gary C. Guenther, Jerome Williams, and Frederick A. Skove Sep. 1981 54 p refs Prepared in cooperation with Naval Academy
(PB82-170184; NOAA-TR-OTES-5; NOAA-81121701) Avail: NTIS HC A04/MF A01 CSCL 08J

The amount of area surveyable with a proposed airborne laser hydrography system is estimated to total 82,000 square kilometers for 10 U.S. sites. The technique uses an aircraft mounted, scanning beam, pulsed laser system to measure water depths. It has been shown that this technique can gather large quantities of accurate bathymetric soundings at a lower cost and with less manpower than present methods. Author

N82-32835# Purdue Univ., Lafayette, Ind. Joint Highway Research Project Office.
PORE SIZE DISTRIBUTION OF SANDY SOILS AND THE PREDICTION OF PERMEABILITY Interim Report
Charng-Hsein Juang 13 Aug. 1981 126 p refs
(Contract HPR-1-19)
(PB82-170143; JHRP-81-15; FHWA/IN/JHRP-81/15) Avail: NTIS HC A07/MF A01 CSCL 08M

The soils used in this study were a sand and two sand clay mixtures. Kneading compaction was used to prepare samples of sand clay mixtures while pluvial compaction was used to prepare compacted samples of sand. The testing program consisted of the permeability test and the pore size distribution (PSD) test. A technique for the preparation of PSD specimens of cohesionless sands was developed. The mercury intrusion technique was used to conduct PSD test. Falling head tests under back pressure were used to measure permeability. The pore size density function of the sands studied showed a single modal characteristic on a log diameter scale while that of and clay mixtures showed biomodal characteristics on the same scale. The influence of varying water content and compactive effort on the fabric of the sandy soils studied was characterized by their pore size distributions and pore size density functions. GRA

N82-32836# Geological Survey, Tallahassee, Fla. Water Resources Div.
WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1980. VOLUME 2A: SOUTH FLORIDA SURFACE WATER Annual Report, 1 Oct. 1979 - 30 Sep. 1980
Oct. 1981 581 p 2 Vol.
(PB82-166232; USGS/WRD/HD-81/005-Vol-1;
USGS/WRD/FL-80/2A-Vol-1) Avail: NTIS HC A25/MF A01 CSCL 08H

Water resources data for 1980 for south Florida includes continuous or daily discharge for 82 streams, periodic discharge for 1 stream, peak discharge for 2 streams, continuous or daily stage for 21 streams and periodic stage for 37 streams; continuous elevations for 15 lakes and periodic elevations or 4 lakes; continuous ground water levels for 178 wells, periodic ground water levels for 178 wells, and miscellaneous water level measurements for 539 wells; quality of water for 136 surface water sites and for 282 wells. GRA

N82-32837# Geological Survey, Tallahassee, Fla. Water Resources Div.
WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1980. VOLUME 2B: SOUTH FLORIDA GROUND WATER Annual Report, 1 Oct. 1979 - 30 Sep. 1980
Oct. 1981 334 p Sponsored in part by the State of Florida 2 Vol.
(PB82-166224; USGS/WRD/HD-81/006-Vol-2;
USGS/WRD/FL-80/2B-Vol-2) Avail: NTIS HC A15/MF A01 CSCL 08H

Water resources data for 1980 for south Florida includes continuous or daily discharge for 82 streams, periodic discharge for 1 stream, peak discharge for 2 streams, continuous or daily stage for 21 streams and periodic stage for 37 streams; continuous elevations for 15 lakes and periodic elevation for 4 lakes; continuous ground water levels for 178 wells, periodic ground water levels for 178 wells, and miscellaneous water level measurements for 539 wells; quality of water for 136 surface water sites and for 282 wells. Water quality data is given. GRA

N82-32838# National Oceanic and Atmospheric Administration, Washington, D. C. Office of Ocean Minerals and Energy.
DEEP SEABED MINING, VOLUME 1 Final Programmatic Environmental Impact Statement
Sep. 1981 323 p refs 2 Vol.
(PB82-155672; NOAA-81102202-Vol-1) Avail: NTIS HC A14/MF A01 CSCL 08I

The Final Programmatic Environmental Impact Statement (PEIS) includes the marine and onshore impacts of the mining of nodules from the deep seabed, their transport to onshore, onshore processing, and waste disposal. Four strategic metals (nickel, cobalt, manganese, and copper) will be produced by this new

U.S. industry. Marine impacts occur in the water-column and on the seafloor. In the water column, the major effect with potential for significant adverse impact involves effects on fish larvae. On the seafloor, organisms will be lost during the collection of nodules from the ocean floor. Neither of these impacts is expected to be significant during the exploration phase. The PEIS discusses regulated mining under the Act as the National Oceanic and Atmospheric Administration's preferred alternative, with continuing review of environmental impacts through monitoring and enviromental research. It also discusses examples of mitigation measures and approaches to conservation of resources likely to arise through commercial recovery. GRA

N82-32839# National Oceanic and Atmospheric Administration, Washington, D. C. Office of Ocean Minerals and Energy.
DEEP SEABED MINING. VOLUME 2: RESPONSE TO COMMENTS Final Programmatic Environmental Impact Statement
Sep. 1981 108 p 2 Vol.
(PB82-155680; NOAA-81102203-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 08I

The full text of the 29 letters received on the raft Programmatic Environmental Impact Statement (PEIS) are included. Some letters dealt with both the draft PEIS and the proposed regulations. The National Oceanic and Atmospheric Administration's (NOAA) response appears on the right side of each page. Each response takes the form of either a note further explaining NOAA's position or a reference to a page on which the text was changed to reflect concurrence with the commenters idea. NOAA's response on the regulations is in the preamble to the final regulations. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N82-32840* NASA Scientific and Technical Information Facility, Baltimore/Washington International Airport, Md. 21240.
ENERGY, A CONTINUING BIBLIOGRAPHY WITH INDEXES. ISSUE 33
Apr. 1982 376 p
(NASA-SP-7043(33); NAS 1.21:7043(33)) Avail: NTIS HC $15.00 CSCL 10A

This bibliography lists 1211 reports, articles, and other documents introduced into the NASA scientific and technical information system from January 1, 1981 through March 31, 1981. M.G.

N82-32841* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PHOTOCAPACITIVE IMAGE CONVERTER Patent
William E. Miller, Arden Sher, and Yuan H. Tsuo, inventors (to NASA) Issued 25 May 1982 7 p Filed 20 Jun. 1980 Supersedes N80-28635 (18 - 19, p 2562)
(NASA-Case-LAR-12513-1; US-Patent-4,331,873;
US-Patent-Appl-SN-161256; US-Patent-Class-250-330;
US-Patent-Class-250-370) Avail: US Patent and Trademark Office CSCL 10A

An apparatus for converting a radiant energy image into corresponding electrical signals including an image converter is described. The image converter includes a substrate of semiconductor material, an insulating layer on the front surface of the substrate, and an electrical contact on the back surface of the substrate. A first series of parallel transparent conductive stripes is on the insulating layer with a processing circuit connected to each of the conductive stripes for detecting the modulated voltages generated thereon. In a first embodiment of the invention, a modulated light stripe perpendicular to the conductive stripes scans the image converter. In a second embodiment a second insulating layer is deposited over the conductive stripes and a second series of parallel transparent conductive stripes perpendicular to the first series is on the second insulating layer. A different frequency current signal is applied to each of the second series of conductive stripes and a modulated image is applied to the image converter.
Official Gazette of the U.S. Patent and Trademark Office

N82-32842# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
MATERIALS TECHNOLOGY ASSESSMENT OF HIGH TEMPERATURE SOLAR RECEIVERS FOR FUELS AND CHEMICALS PRODUCTION
T. N. Tiegs Jul. 1981 25 p refs
(Contract W-7405-eng-26)
(ORNL/TM-7802) Avail: NTIS HC A02/MF A01

Current interest in using solar thermal energy to produce fuels and chemicals has prompted an assessment of materials technology for five proposed designs of solar receivers. The principal process of interest is water splitting. Reaction schemes considered involve the high temperature decomposition of sulfuric acid, and silicon carbide is the structural ceramic material usually considered most resistant to the conditions of this reaction. Hence we have assessed the fabricability of the designs from SiC for that reaction system, even though most designs envision use with air, helium, or nitrogen as a heat transfer medium. Honeycomb and hemispherical dome receivers have been fabricated from SiC. A receiver using planar coiled tubes has been fabricated from cordierite but not from SiC. Fabrication has not been demonstrated for helical coil and long tube designs. The last three of these should be fabricable with up to two years development. All lack the ultimate test: operational experience. The need for reliable seals is common to all designs. Metallic gaskets are subject to corrosion, and ceramic and mechanical seals have not been demonstrated for the anticipated thermal cycling. Author

N82-32843*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
REACTANT PRESSURE DIFFERENTIAL CONTROL FOR FUEL CELL GASES Patent Application
Arthur P. Grasso, inventor (to NASA) (Hamilton Standard, Windsor Locks, Conn.) Filed 1 Jul. 1982 8 p Sponsored by NASA
(NASA-Case-MSC-20127-1; US-Patent-Appl-SN-394344) Avail: NTIS HC A02/MF A01 CSCL 10A

A pair of values connected in tandem are balanced between pressure of reactant gases supplied to a fuel cell power plant to control the pressure differences between the gases so as to maintain those pressure substantially in the proportions necessary for operation of the fuel cell. NASA

N82-32844# Oak Ridge National Lab., Tenn. Energy Div.
LARGE CLIMATE-MODERATING ENVELOPES FOR ENCLOSED STRUCTURES. A PRELIMINARY EVALUATION OF ENERGY CONSERVATION POTENTIAL
R. L. Wendt, G. E. Giles, and J. E. Park Dec. 1981 113 p refs
(Contract W-7405-eng-26)
(ORNL/TM-8018) Avail: NTIS HC A06/MF A01

A preliminary estimate of the energy conservation benefits of a large climate moderating envelope (LCME). A hypothetical LCME design was chosen and a coupled fluid dynamic and energy transport analysis was performed to estimate the energy conservation potential of this design. The heat transfer models included insolation, outside air temperature and wind, thermal radiation exchange with the sky and between the fabric and ground and thermal storage in the earth mass beneath the LCME. The energy transported within the fluid by the buoyancy driven circulation was modeled as an incompressible fluid utilizing the Boussinesq approximation. The climatic conditions were assumed to vary in smooth repeating daily cycles. The numerical simulation of climatic variation was continued until the results within the LCME achieved a repeating daily cycle. The results for selected seasonally

characteristic days were utilized to estimate the annual energy consumption of structures within an LCME relative to similar structures exposed to the exterior environment. Author

N82-32845*# Spectrolab, Inc., Sylmar, Calif.
DESIGN, ANALYSIS AND TEST VERIFICATION OF ADVANCED ENCAPSULATION SYSTEMS Triannual Report, period ending 31 Mar. 1982
Alec Garcia and Chuck Minning Jun. 1982 9 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955567)
(NASA-CR-159306; DOE/JPL-955567-82/7; NAS 1.26:159306) Avail: NTIS HC A02/MF A01 CSCL 10A

Analytical models were developed to perform optical, thermal, electrical and structural analyses on candidate encapsulation systems. Qualification testing, specimens of various types, and a finalized optimum design are projected. Author

N82-32846*# Photowatt International, Inc., Tempe, Ariz.
DESIGN, FABRICATION, TEST QUALIFICATION AND PRICE ANALYSIS OF A THIRD GENERATION SOLAR CELL MODULE Final Report
Jun. 1982 17 p Sponsored in part by DOE Prepared for JPL
(Contract JPL-955410)
(NASA-CR-169315; DOE/JPL-955410-82/1; JPL-9950-715; NAS 1.26:169315; DRL-112; DRD-SE-2) Avail: NTIS HC A02/MF A01 CSCL 10A

The design, fabrication, test, and qualification of a third generation intermediate load solar cell module are presented. A technical discussion of the detailed module design, preliminary design review, design modifications, and environmental testing are included. A standardized pricing system is utilized to establish the cost competitiveness of this module design. Author

N82-32847*# Science Applications, Inc., McLean, Va.
SOLAR THERMAL PLANT IMPACT ANALYSIS AND REQUIREMENTS DEFINITION STUDY Final Report
5 Feb. 1982 522 p refs Prepared for JPL
(Contract JPL-955238)
(NASA-CR-169310; JPL-9950-716; NAS 1.26:169310) Avail: NTIS HC A22/MF A01 CSCL 10A

The technology and economics of solar thermal electric systems (STES) for electric power production is discussed. The impacts of and requirements for solar thermal electric power systems were evaluated. Author

N82-32848*# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
A MODULE EXPERIMENTAL PROCESS SYSTEM DEVELOPMENT UNIT (MEPSDU) Summary Technical Report, 26 Nov. 1980 - 10 Feb. 1982
10 Feb. 1982 114 p refs Sponsored in part by DOE
(Contract JPL-955909)
(NASA-CR-169303; DOE/JPL-955909-82/6; NAS 1.26:169303; TME-3149) Avail: NTIS HC A06/MF A01 CSCL 10A

Restructuring research objectives from a technical readiness demonstration program to an investigation of high risk, high payoff activities associated with producing photovoltaic modules using non-CZ sheet material is reported. Deletion of the module frame in favor of a frameless design, and modification in cell series parallel electrical interconnect configuration are reviewed. A baseline process sequence was identified for the fabrication of modules using the selected dendritic web sheet material, and economic evaluations of the sequence were completed. Author

N82-32849*# Energy Materials Corp., Lancaster, Mass.
LOW ANGLE SILICON SHEET GROWTH. LARGE AREA SILICON SHEET TASK LOW COST SOLAR ARRAY PROJECT
Apr. 1982 34 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955378)
(NASA-CR-169183; DOE/JPL-955378-82/1; JPL-9950-719; NAS 1.26:169183) Avail: NTIS HC A03/MF A01 CSCL 10A

The results of a program to demonstrate the feasibility of a low angle silicon ribbon growth process are described. Twenty-six experimental runs were performed. Ribbons were grown at pull rates from 5 to 68 cm/min. Ribbon lengths up to 74 cm were grown while widths varied from 5 to 25 mm. Thicknesses varied from 0.6 to 2.5 mm, with typical values of about 1 mm. Author

N82-32850*# Spectrolab, Inc., Sylmar, Calif.
DESIGN, ANALYSIS AND TEST VERIFICATION OF ADVANCED ENCAPSULATION SYSTEMS, PHASE 2 PROGRAM RESULTS Periodic Report, period ending 1 Oct. 1981
Alec Garcia, III, Chuck Minning, R. T. Breen, J. F. Coakley, L. B. Duncan, D. M. Gllaspy, R. H. Kiewert, F. G. McKinney, W. E. Taylor, and L. E. Vaughn Jun. 1982 210 p refs Sponsored in part by DOE Prepared for JPL Prepared in cooperation with Hughes Aircraft Co.
(Contract JPL-955567)
(NASA-CR-169300; DOE/JPL-955567-82/8-Suppl; JPL-9950-720-Suppl; NAS 1.26:169300) Avail: NTIS HC A10/MF A01 CSCL 10A

Optical, electrical isolation, thermal structural, structural deflection, and thermal tests are reported. The utility of the optical, series capacitance, and structural deflection models was verified. Author

N82-32851*# Arizona Univ., Tucson. Optical Sciences Center.
THE SMALL MODULE FIXED MIRROR DISTRIBUTED FOCUS (FMDF) PHOTOTHERMAL CONCENTRATOR STUDY Final Report
A. B. Meinel 27 Feb. 1981 32 p refs
(Contracts NAS 7-100; JPL-955162)
(NASA-CR-169302; NAS 1.26:169302) Avail: NTIS HC A03/MF A01 CSCL 10A

The development of a general ray trace evaluation program called ICARUS, the study of novel Fresnel concepts, and the review of a report draft on novel Fresnel concepts are covered. ICARUS is documented, reports on the novel Fresnel concepts were previously submitted. Author

N82-32852*# Benham Group, Oklahoma City, Okla.
LAND AVAILABILITY AND LAND VALUE ASSESSMENT FOR SOLAR PONDS IN THE UNITED STATES
May 1982 359 p refs Prepared for JPL
(Contracts NAS7-100; JPL-955978)
(NASA-CR-169198; JPL-9950-723; NAS 1.26:169198) Avail: NTIS HC A16/MF A01 CSCL 10A

The land availability and land values for solar ponds in the United States as they concern the residential, commercial, and institutional land use categories were investigated. Solar ponds were identified as efficient and economical means for collecting and storing direct and diffuse solar energy. Innovative methodologies were applied to arrive at regional projections regarding the amount of land that might potentially be available for retrofit or future solar pond applications. Regional land values were also documented and analyzed. Author

N82-32853*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DETERMINATION OF OPTIMUM SUNLIGHT CONCENTRATION LEVEL IN SPACE FOR 3-4 CASCADE SOLAR CELLS
Henry B. Curtis 1982 14 p refs Presented at the 3rd European Symp. on Photovoltaic Generators in Space, Bath, Engl., 4-6 May 1982; sponsored by RAE and ESA
(NASA-TM-82899; E-1282; NAS 1.15:82899) Avail: NTIS HC A02/MF A01 CSCL 10A

The optimum range of concentration in space for III-V cascade cells has been calculated using a realistic solar cell diode equation. Temperature was varied with concentration using several models and ranged from 55 deg at one sun to between 80 deg and 200 deg C at 100 suns. A variety of series resistance and internal resistances were used. Coefficients of the diffusion and recombination terms are strongly temperature dependent. The study indicates that the maximum efficiency of 30 percent occurs in the 50 to

100 X sun concentration range provided series resistance is below 0.015 ohm sq cm and cell temperature is about 80 C at 100 suns. Author

N82-32854*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LARGE AREA LOW-COST SPACE SOLAR CELL DEVELOPMENT
C. R. Baraona and J. L. Cioni (NASA. Johnson Space Center, Houston, Tex.) 1982 9 p refs Presented at the 3rd European Symp. on Photovoltaic Generators in Space, Bath, Engl., 4-6 May, 1982; sponsored by RAE and ESA
(NASA-TM-82902; E-1285; NAS 1.15:82902) Avail: NTIS HC A02/MF A01 CSCL 10A

A development program to produce large-area (5.9 x 5.9 cm) space quality silicon solar cells with a cost goal of 30 $/watt is described. Five cell types under investigation include wraparound dielectric, mechanical wraparound and conventional contact configurations with combinations of 2 or 10 ohm-cm resistivity, back surface reflectors and/or fields, and diffused or ion implanted junctions. A single step process to cut cell and cover-glass simultaneously is being developed. A description of cell developments by Applied Solar Energy Corp., Spectrolab and Spire is included. Results are given for cell and array tests, performed by Lockheed, TRW and NASA. Future large solar arrays that might use cells of this type are discussed. Author

N82-32855*# PRC Systems Sciences Co., Tucson, Ariz.
GALLIUM ARSENIDE SOLAR ARRAY SUBSYSTEM STUDY Final Report, Jan. 1981 - Feb. 1982
F. Q. Miller Feb. 1982 221 p refs
(Contract NAS3-22667)
(NASA-CR-167869; NAS 1.26:167869) Avail: NTIS HC A10/MF A01 CSCL 10A

The effects on life cycle costs of a number of technology areas are examined for a gallium arsenide space solar array. Four specific configurations were addressed: (1) a 250 KWe LEO mission - planer array; (2) a 250 KWe LEO mission - with concentration; (3) a 50 KWe GEO mission planer array; (4) a 50 KWe GEO mission - with concentration. For each configuration, a baseline system conceptual design was developed and the life cycle costs estimated in detail. The baseline system requirements and design technologies were then varied and their relationships to life cycle costs quantified. For example, the thermal characteristics of the baseline design are determined by the array materials and masses. The thermal characteristics in turn determine configuration, performance, and hence life cycle costs. Author

N82-32856*# Westinghouse Electric Corp., Madison, Pa. Synthetic Fuels Div.
LOW AND MEDIUM HEATING VALUE COAL GAS CATALYTIC COMBUSTOR CHARACTERIZATION
John A. Schwab Nov. 1982 137 p refs
(Contracts DEN3-277; DE-AI01-77ET-10350)
(NASA-CR-165560; DOE/NASA/0277-1; NAS 1.26:165560) Avail: NTIS HC A07/MF A01 CSCL 10B

Catalytic combustion with both low and medium heating value coal gases obtained from an operating gasifier was demonstrated. A practical operating range for efficient operation was determined, and also to identify potential problem areas were identified for consideration during stationary gas turbine engine design. The test rig consists of fuel injectors, a fuel-air premixing section, a catalytic reactor with thermocouple instrumentation and a single point, water cooled sample probe. The test rig included inlet and outlet transition pieces and was designed for installation into an existing test loop. S.L.

N82-32857# Texas Univ., Arlington. Dept. of Mechanical Engineering.
SOLAR PHOTOVOLTAIC/THERMAL RESIDENTIAL EXPERIMENT, PHASE 2 Final Report
S. T. Kugle, J. R. Leith, and M. S. Svane Aug. 1981 74 p refs
(Contract DE-AC02-76ET-20279)
(COO-4577-10) Avail: NTIS HC A04/MF A01

Performance and operation of photovoltaic and thermal solar heating and cooling systems were evaluated in order to assess the feasibility of hybrid photovoltaic/thermal collectors. Experiments were carried out at an instrumented single-family dwelling/research facility at the University of Texas at Arlington. The cooling load was the dominant comfort consideration, since the climate at the research site (in north central Texas) is generally regarded as humid subtropical with hot summers. Several solar-assisted heating and cooling configurations were considered for a basic system comprised of the photovoltaic and thermal collectors, a thermal storage tank, and a two-speed heat pump. The photovoltaic array, with an area of 109 sq. m was part of a utility-interactive ('line-stuffing') power system. Average solar-to-dc conversion efficiency of the array was 4.7%. Efficiency of the thermal collectors, with an area of 48.4 sq. m, was 5 to 20% and was dependent upon the difference between the glycol-water collector loop and thermal storage tank temperatures. Design objectives and operational strategies for hybrid photovoltaic/thermal collector systems were developed. Author

N82-32858*# Boeing Commercial Airplane Co., Seattle, Wash. System Technology Staff.
INTEGRATED ENERGY MANAGEMENT STUDY. ENERGY EFFICIENT TRANSPORT PROGRAM Contractor Final Report, 10 Aug. 1977 - 7 Jan. 1978
Mar. 1979 102 p refs
(Contract NAS1-14742)
(NASA-CR-158980; NAS 1.26:158980; D6-46700) Avail: NTIS HC A01/MF A01 CSCL 10B

The Integrated Energy Management (IEM) Study investigated the practicality and feasibility of a closed-loop energy management system for transport aircraft. The study involved: (1) instrumentation and collection of in-flight data for a United Airlines 727-200 flying 80 revenue flights throughout the United Airlines network,(2) analysis of the in-flight data to select representative city pairs and establish operational procedures employed in flying a reference flight profile, (3) simulation of the reference profile in a fast-time model to verify the model and establish performance values against which to measure IEM benefits, (4) development of IEM algorithms, and (5) assessment of the IEM concept. Author

N82-32859*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ENERGY SAVING CONCEPTS RELATING TO INDUCTION GENERATORS
Frank Nola Aug. 1980 12 p refs
(NASA-TP-1719; NAS 1.60:1719) Avail: NTIS HC A02/MF A01 CSCL 10B

Energy saving concepts relating to induction generators are presented. The first describes a regenerative scheme using an induction generator as a variable load for prime movers under test is described. A method for reducing losses in induction machines used specifically as wind driven generators is also described. S.L.

N82-32860# Department of Energy, Oak Ridge, Tenn. Technical Information Center.
DIRECT ENERGY CONVERSION, A CURRENT AWARENESS BULLETIN
30 Aug. 1982 20 p
(PB82-946616; DOEDEC-82/16) Avail: NTIS HC A02/MF A01 CSCL 10A

This bulletin contains 94 abstracts and bibliographic citations of scientific and technical reports, journal articles, conference proceedings, patents, books, and other published literature on all aspects of direct energy conversion. A subject index and a report number index are provided. This information is selected from the DOE/TIC Energy Data Base. J.M.S.

N82-32861*# Rockwell International Science Center, Thousand Oaks, Calif.
III-V SEMICONDUCTOR SOLID SOLUTION SINGLE CRYSTAL

GROWTH Final Report, 6 Apr. 1979 - 16 Apr. 1981
E. R. Gertner Feb. 1982 72 p refs Prepared for JPL
(Contracts NAS7-100; JPL-955352)
(NASA-CR-169301; JPL-9950-722; NAS 1.26:169301; SC5210.51FR) Avail: NTIS HC A04/MF A01 CSCL 10A

The feasibility and desirability of space growth of bulk IR semiconductor crystals for use as substrates for epitaxial IR detector material were researched. A III-V ternary compound (GaInSb) and a II-VI binary compound were considered. Vapor epitaxy and quaternary epitaxy techniques were found to be sufficient to permit the use of ground based binary III-V crystals for all major device applications. Float zoning of CdTe was found to be a potentially successful approach to obtaining high quality substrate material, but further experiments were required. Author

N82-32862*# Texas Research and Engineering Inst., Inc., Port Neches.
SILICON PRODUCTION PROCESS EVALUATIONS Final Report, 18 May 1981 - 30 Jul. 1982
30 Jul. 1982 177 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-956045)
(NASA-CR-169163; DOE/JPL-956045-82/5; NAS 1.26:169163) Avail: NTIS HC A09/MF A01 CSCL 10A

Chemical engineering analyses involving the preliminary process design of a plant (1,000 metric tons/year capacity) to produce silicon via the technology under consideration were accomplished. Major activities in the chemical engineering analyses included base case conditions, reaction chemistry, process flowsheet, material balance, energy balance, property data, equipment design, major equipment list, production labor and forward for economic analysis. The process design package provided detailed data for raw materials, utilities, major process equipment and production labor requirements necessary for polysilicon production in each process. Author

N82-32863*# Kayex Corp., Rochester, N. Y.
DEVELOPMENT OF ADVANCED CZOCHRALSKI GROWTH PROCESS TO PRODUCE LOW COST 150 kg SILICON INGOTS FROM A SINGLE CRUCIBLE FOR TECHNOLOGY READINESS Quarterly Progress Report, 1 Oct. - 31 Dec. 1981
R. L. Lane 1981 32 p Sponsored in part by DOE Prepared for JPL
(Contract JPL-955733-5)
(NASA-CR-169186; NAS 1.26:169186; DRL-136; DRD-SE-5; QPR-5) Avail: NTIS HC A03/MF A01 CSCL 10A

Six growth runs used the Kayex-Hameo Automatic Games Logic (AGILE) computer based system for growth from larger melts in the Mod CG2000. The implementation of the melt pyrometer sensor allowed for dip temperature monitoring and usage by the operator/AGILE system. Use of AGILE during recharge operations was successfully evaluated. The tendency of crystals to lose cylindrical shape (spiraling) continued to be a problem. The hygrometer was added to the Furnace Gas Analysis System and used on several growth runs. The gas chromatograph, including the integrator, was also used for more accurate carbon monoxide concentration measurements. Efforts continued for completing the automation of the total Gas Analysis System. An economic analysis, based on revised achievable straight growth rate, is presented. Author

N82-32864*# Cornell Univ., Ithaca, N. Y. Dept. of Materials Science and Engineering.
AN EBIC STUDY OF HEM POLYCRYSTALLINE SILICON
T. Koch (Hewlett-Packard Co.) and D. Ast 27 May 1982 29 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-956046)
(NASA-CR-169296; DOE/JPL-956046-82/4; NAS 1.26:169196) Avail: NTIS HC A03/MF A01 CSCL 10A

Low-cost silicon for solar cells grown by the heat exchanger method (HEM) was studied in the electron beam induced current (EBIC) mode of a scanning electron microscope (SEM). Comparisons were made between the defects observed optically and the recombination centers visiible in EBIC. Much of the HEM material was single crystalline, but structural defects were found from areas near the corners of the grown material. Most of these defects consisted of linear twin boundaries and grain boundaries. The electrical activity of these boundaries was dependent on symmetry of the boundaries. Symmetric twin boundaries did not exhibit recombination activity while unsymmetric twin boundaries were electrically active. Author

N82-32865# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TEST STATION FOR SOLAR COLLECTORS IN LOW AND HIGH TEMPERATURE RANGE
J. Anhalt and J. M. V. Martins Jul. 1982 15 p refs Presented at the 1st Latin Am. Congr. on Heat and Mass Transfer
(INPE-2457-PRE/152) Avail: NTIS HC A02/MF A01

A collector test field was established. With the four installed test loops it is possible to test different kinds of solar collectors and collector banks in a temperature range from 30 C up to 250 C with a maximum power of 20 kW. The measurement equipment including a solar meteorological stations meets all requirements to carry out collector test according to international standards. Three types of collector banks, flat-plate, booster mirror collectors and parabolic trough collectors with approximately 20 sq m aperture area each are installed and under short and long term test. For typical applications, e.g. process heat in the range of 120 C up to 200 C, special experiments with outlet temperatures at fixed levels were performed. Author

N82-32866# Army Cold Regions Test Center, Fort Greely, Ark. Civil Engineering Research Branch.
EVALUATING THE HEAT PUMP ALTERNATIVE FOR HEATING ENCLOSED WASTEWATER TREATMENT FACILITIES IN COLD REGIONS
C. James Martel and Gary E. Phetteplace May 1982 26 p refs (DA Proj. 4A7-62730-AT-42)
(AD-A116385; CRREL-SR-82-10) Avail: NTIS HC A03/MF A01 CSCL 13/1

This report presents a five-step procedure for evaluating the technical and economic feasibility of using heat pumps to recover heat from treatment plant effluent. The procedure is meant to be used at the facility planning level by engineers who are unfamiliar with this technology. An example of the use of the procedure and general design information are provided. Also, the report reviews the operational experience with heat pumps at wastewater plants located in Fairbanks, Alaska, Madison, Wisconsin, and Wilton, Maine. Author (GRA)

N82-32867# EIC, Inc., Newton, Mass.
THERMAL DECOMPOSITION OF DIMETHOXYMETHANE ELECTROLYTE SOLUTION
J. S. Foos and V. Meltz Jun. 1982 20 p refs Submitted for publication
(Contract N00014-77-C-0155; NR Proj. 359-638)
(AD-A116789; TR-8) Avail: NTIS HC A02/MF A01 CSCL 10/3

The electrolyte solution prepared from LiAsF6 and dimethoxymethane (DMM) was investigated for use in secondary lithium batteries. Storage tests were conducted at 70 C. In the presence of Li the best samples of electrolyte were stable to Li for more than one month. In the absence of Li, the electrolyte solution decomposed within days with loss of DMM, and formation of methyl formate and dimethyl ether in a 1:2 ratio. The products were identified and product ratio determined using IR and proton NMR spectroscopy. A chain reaction mechanism is proposed for the decomposition which postulates oxygen stabilized carbocation intermediates. Because the reaction may be impurity initiated and is quenched by Li metal, the importance of purification and storage of electrolyte with Li, is emphasized. Author (GRA)

N82-32868# EIC, Inc., Newton, Mass.
LITHIUM CYCLING IN POLYMETHOXYMETHANE SOLVENTS
J. S. Foos and J. McVeigh Jun. 1982 17 p refs Submitted for publication
(Contract N00014-77-C-0155; NR Proj. 359-638)

(AD-A116790; TR-7) Avail: NTIS HC A02/MF A01 CSCL 10/3

Solutions of LiAsF6 in dimethoxymethane (DMM) and trimethoxymethane (TMM) are shown to be conductive and capable of cycling Li in high efficiency in half-cells. Inspection of electrolytes stored at 70 C in the presence and absence of Li indicated that TMM is more stable than DMM. However, DMM cycles Li much better than TMM after storage. GRA

N82-32869# Northeastern Univ., Boston, Mass. Dept. of Mechanical Engineering.

NOVEL APPROACH TO THE EXPLOITATION OF THE TIDAL ENERGY. VOLUME 1: SUMMARY AND DISCUSSION Final Report

Alexander M. Gorlov Dec. 1981 77 p refs
(Contract DE-AS02-79ER-10469)
(DE82-010829; DOE/ER-10469/1-Vol-1) Avail: NTIS HC A05/MF A01

The hydropneumatic concept in the approach to harnessing low tidal hydropower is discussed. The energy of water flow is converted into the energy of an air jet by a specialized air chamber which is placed on the ocean floor across a flowing watercourse. Water passes through the chamber where it works as a natural piston compressing air in the upper part of the closure. Compressed air is used as a new working plenum to drive air turbines. The kinetic energy of an air jet provided by the air chamber is sufficient for stable operation of industrial air turbines. It is possible to use light plastic barriers instead of conventional rigid dams (the water sail concept). It is confirmed that the concept can result in a less expensive and more effective tidal power plant project than the conventional hydroturbine approach. DOE

N82-32870# Technical Univ. of Denmark, Lyngby. Lab. for Varmeisolering.

TWO SOLAR HEATING SYSTEMS FOR WATER HEATING. A DESCRIPTION AND EVALUATION AFTER 4-MONTHS OPERATIONS

Klaus Ellehauge, Leif Sonderskov Jorgensen, Mads Lange, Svend Erik Mikkelsen, and Carsten Nielsen Dec. 1980 55 p In DANISH
(DE82-900831; DTH-LV-MEDD-104; ESR-12) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

Efficiency and reliability of two different solar heating systems were imperfections. The heating systems, planned for a 4 person family, consisted of 5.4 m(2) solar collector and 300 l storage tank with heat exchanger in the bottom. Insulation, yield, and decreased oil use are evaluated. DOE

N82-32871# Houston Univ., Tex.

SOLAR PRODUCTION OF ELEMENTAL PHOSPHORUS Final Report

T. P. Whaley, B. D. Yudow, and J. D. Schreiber Nov. 1981 71 p refs Prepared in cooperation with Inst. of Gas Technology
(Contract DE-AC03-80SF-11422)
(DE82-010118; DOE/SF-11422/T1) Avail: NTIS HC A04/MF A01

A project is described which was to determine the technical feasibility of using a solar furnace to produce elemental phosphorus and to provide guidelines for future reactor designs. A laboratory program showed that elemental phosphorus may be produced by heating an intimate mixture of phosphate rock, silica, and carbon black to 13000 to 15000 C and sweeping the phosphorus vapors from the reactor with argon. Phosphorus vapors are bubbled through a copper sulfate solution to minimize any potential exposure of personnel. Four successful solar furnace runs at the White Sands Solar Facility are reported. The design and testing of the solar receiver/reactor are discussed. DOE

N82-32872# Technical Research Centre of Finland, Espoo.

PROPERTIES OF SOLAR AND WARM AIR HEATING SYSTEMS AND ENERGY SAVING PROSPECTS COMPARED WITH ELECTRICAL HEATING

Timo Kalema 1980 63 p refs In FINNISH; ENGLISH summary
(DE82-901526; VTT-LVI-50) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The operation of a solar and warm air heating system and of direct electrical heating was studied in two similar apartments during one year. The goal was to find out the properties of solar and warm air heating system in practice, and particularly the amount of energy obtained from the collector. In addition, attempts were made to estimate the energy saving prospects of the system compared with electrical heating by measurements in two similar apartments. DOE

N82-32873# American Boiler Mfrs. Association, Arlington, Va.

EMISSIONS AND EFFICIENCY PERFORMANCE OF INDUSTRIAL COAL STOKER FIRED BOILERS: DATA SUPPLEMENT

Aug. 1981 493 p
(Contracts DE-AC01-77ET-10386; EF-77-C-01-2609)
(DE81-030266; DOE/ET-10386/T1-Vol-3) Avail: NTIS HC A21/MF A01

Tables and plots of field test data on emissions and efficiency performance of coal stoker fired boilers are given. The tables contain the gaseous, particulate, coal and efficiency data. The plots correlate the major parameters with percent boiler design capacity and excess air. A few additional relationships are also included in the plots. The data supplement is based on the findings of an extensive coal stoker test program. GRA

N82-32874# National Center for Resource Recovery, Washington, D. C.

REVIEW OF COMPARATIVE ENERGY USE IN MATERIALS POTENTIALLY RECOVERABLE FROM MUNICIPAL SOLID WASTE

Marc L. Renard Mar. 1982 79 p refs
(Contract DE-AC01-76CS-20167)
(DE82-012375; DOE/CS-20167/12) Avail: NTIS HC A05/MF A01

Published literature on the energy savings that might be realized from manufacturing four materials present in municipal solid waste (MSW), using recycled rather than virgin materials is reviewed. The four materials examined are glass, paper, steel, and aluminum. An attempt is made to assess this energy savings, reported by diverse sources, on a consistent basis or at least by pointing out the conceptual bases on which the results were obtained. Significant savings in manufacturing energy are achievable for aluminum, steel, glass, and certain grades of paper. These materials are all potentially recoverable from the municipal solid waste stream, but must be of a purity and in a form acceptable to the respective industries for reuse in manufacturing. DOE

N82-32875# Tennessee Valley Authority, Knoxville. Div. of Energy Conservation and Rates.

HEAT PUMP WATER HEATER FIELD TEST Final Report

1981 63 p refs
(DE82-010272; TVA/OP/ECR-82/17) Avail: NTIS HC A04/MF A01

The benefits, performance, reliability, and costs associated with heat pump water heaters were determined. Various aspects of the field test are described which include: project description, equipment characteristics, participant selection, data collection methods, and evaluation methodologies. The effects of heat pump water heaters on total energy and total demand with respect to water heating are addressed. The reliability of heat pump water heaters is recounted. Customer reaction to heat pump water heater performance is discussed and heat pump water heater field tests conducted by other utilities across the country are reviewed. DOE

N82-32876# North Dakota Univ., Grand Forks. Engineering Experiment Station.

DESIGN AND DEVELOPMENT OF A SPLIT-EVAPORATOR HEAT-PUMP SYSTEM

M. H. Somerville and S. G. Penoncello Dec. 1981 242 p refs Sponsored in part by the Northern States Power Co., Ottertail Power Cooperative, Minnkota Power Cooperative, and the Westinghouse Electric Corp.
(Contract W-7405-eng-26)

(DE82-007112; ORNL/Sub-7434-1) Avail: NTIS HC A11/MF A01

Three types of multiple source heat pumps are presented. The three designs are the parallel evaporator, the series evaporator, and the parallel evaporator with active subcooling, with the parallel evaporator with the active subcooling showing the most promise for solving the problem of defrosting of air evaporators. The models are based upon the refrigerant flow rate, rather than the refrigeration effect of the evaporator. It is shown that the temperature of the air surrounding the flat plate ice maker plays a dominant role in the rate of ice formation. A weather analysis for forty cities throughout the nation was completed. These data were processed to allow easy computation of thermal storage requirements, such as off peak air conditioning. The results of an ice storage system that is thermally coupled to the Earth are described. An economic and energy comparison of multiple source heat pumps with ACES, and air-to-air heat pump systems is presented. DOE

N82-32877# New Mexico State Univ., Las Cruces. Solar Energy Inst.

DATA REPORT FOR THE SOUTHWEST RESIDENTIAL EXPERIMENT STATION, OCTOBER 1981

J. F. Schaefer, O. Y. Hai, G. Hocking, and C. Whitaker 16 Nov. 1982 22 p Prepared in cooperation with MIT

(Contract DE-AC02-76ET-20279)

(DE82-010854; DOE/ET-20279/167) Avail: NTIS HC A02/MF A01

Residential photovoltaic systems (PV) were developed to gather and disseminate performance data for the photovoltaic community and cognizant institutions. Each prototype system consists of a roof mounted PV array, sized to meet at least 50% of the annual electric demand of an energy conserving house, and an enclosed structure to house the remainder of the PV system equipment, test instrumentation, and work space. The arrays provide dc energy, which is converted to ac energy by power conditioning equipment to service all of the usual loads of the residence. One month of performance data obtained from the eight SW RES Prototype Systems are presented. DOE

N82-32878# Prototech, Inc., Newton Highlands, Mass.

ENERGY SAVINGS BY MEANS OF FUEL-CELL ELECTRODES IN ELECTROCHEMICAL INDUSTRIES Final Report, 1 Aug. 1980 - 31 Jul. 1981

Amiram Bar-Ilan, Walter Juda, and Brian P. Finnigan 20 Nov. 1981 83 p refs

(Contract DE-AC02-78ET-25309)

(DE82-010485; DOE/ET-25309/34; COO-4881-34) Avail: NTIS HC A05/MF A01

A pretreatment protocol for improvement in the performance of Prototech's zinc electrowinning cell with purification of the Zn SO4 feed solution, was developed. Measurable improvements in cell voltage and current efficiency, and a reduction in energy consumption was obtained. The anode operating potential determination together with the overall (anode-to-cathode) cell potential, evaluate cell performance with alternative platinum catalysts, porous supports and current collectors. Life tests were carried out with a number of types with various loadings of platinum and with a standard loading of palladium. Testing with anodes with all levels of platinum loading demonstrated sustained energy efficient performance. Hydrogen gas feed and liquid recirculation with depth were adjusted. The additives used to pretreat the feed were modified. A depth cell was tested at depths of 1, 2, and 3 feet. Increase in cell voltage with increased cell size was largely offset by replacement of the edge wise graphite current collector with a porous metallic current collector, as well as by improved contact between electrode and current collector. DOE

N82-32879# Southern Solar Energy Center Planning Project, Atlanta, Ga.

FUNDAMENTALS OF SOLAR ACCESS

Mike Levin 1 Apr. 1981 22 p refs Presented at the Alabama Solar Access Conf., 1 Apr. 1981; sponsored by the Alabama Dept. of Energy and at the Solar Symp. for Local Officials, 5 May 1981; sponsored by the National League of Cities, the National Association of County Officials and the US Conf. of Mayors and at the Symp. on Legal Issues in Building Codes Administration, 7 May 1981; sponsored by the National Conference of States on Building Codes and Standards

(Contract DE-AC02-79CS-30166)

(DE82-009481; SSEC/SP-33233) Avail: NTIS HC A02/MF A01

Aspects of solar access are examined. The following topics are discussed: solar geometry, topography, orientation, trees and vegetation, design options, and legal questions. DOE

N82-32880# Engineering and Economics Research, Inc., Vienna, Va.

HYDROTHERMAL INDUSTRIALIZATION ELECTRIC-POWER SYSTEMS DEVELOPMENT Final Report

J. Markiewicz and M. Albert Mar. 1982 206 p

(Contract DE-AC07-80ID-12186)

(DE82-009295; DOE/ID-12186/T1) Avail: NTIS HC A10/MF A01

The nature of hydrothermal resources, their associated temperatures, geographic locations, and developable capacity are described. The parties involved in development, required activities and phases of development, regulatory and permitting requirements, environmental considerations, and time required to complete development activities are examined and development costs are described. A profile of the geothermal industry and participants and their operating characteristics is presented. The current development status of geothermal energy in the US is outlined. The work on market penetration is summarized and development information for 56 high temperature sites is presented. DOE

N82-32881# Florida Solar Energy Center, Cape Canaveral.

SOLAR COLLECTOR TEST REPORT

William E. Stoney, comp. Jun. 1981 63 p

(Contract DE-AC02-79CS-30166)

(DE82-009467; SSEC/TP-12226) Avail: NTIS HC A04/MF A01

The commercial readiness and potential of an all plastic solar hot water collector were evaluated. The collector is described and data are given for the efficiency curve, incident angle modifier, raw test data, and static tests. The design demonstrates that a thin film plastic absorber can be built to produce performance at least equal to the mid range of conventional copper or aluminum absorbers and that production costs could be at least half that of currently available collectors. DOE

N82-32882# Hawaii Univ., Honolulu. Hawaii Natural Energy Inst.

OCEAN THERMAL ENERGY CONVERSION: A REVIEW

Paul C. Yuen Oct. 1981 178 p refs

(DE82-901167; HNEI-81-03) Avail: NTIS HC A09/MF A01

The OTEC principle along with general system and cycle, types, specific OTEC designs, OTEC applications, and the ocean thermal resource are discussed. The historic development of OTEC is reviewed, and the status of French, Japanese, EUROCEAN, and US programs is assessed. Power system components of the more technically advanced closed cycle OTEC concept are examined. These include: heat exchangers, corrosion and biofouling countermeasures, working fluids, ammonia power systems, and on platform seawater systems. Several open cycle features are also discussed. The ocean engineering aspects of OTEC power systems are reviewed. Major subsystems such as platform, cold water pipe, mooring system, dynamic positioning system, power transmission cable system are assessed for their relationships with the ocean environment and with each other. Possible environmental and social effects of OTEC development are discussed. DOE

N82-32883# Institute of Gas Technology, Chicago, Ill.

METHANE FROM COAL SEAMS

Mark C. Doherty 1981 14 p refs Presented at the Intern. Conf. on Small Energy Sources, Los Angeles, 9-18 Sep. 1981

(Contract DE-AC21-79ET-14851)

(DE82-902126; CONF-8109111-2) Avail: NTIS HC A02/MF A01

Coalbed methane resources are discussed. The technology to

recover the gas, the ongoing research and development, and coal seam gas as a source of energy are examined. DOE

N82-32884# Oak Ridge National Lab., Tenn.
UTILITY-CONTROLLED CUSTOMER-SIDE THERMAL-ENERGY-STORAGE TESTS: HEAT STORAGE
D. T. Rizy Feb. 1982 83 p refs
(Contract W-7405-eng-26)
(DE82-007722; ORNL-5796) Avail: NTIS HC A05/MF A01

Customer side thermal energy storage was identified as a load management option available to the electric utility industry. Five heat storage tests are described to: collect reliable load research data; delineate and solve installation problems; establish maintainability; determine customer and utility acceptance; and generate cost data to determine the potential of utility controlled customer side storage as a load management option. The utilities tested four types of heat storage systems: central ceramic brick concrete slab heat pump with storage and pressurized hot water storage. Installation and operation the storage systems indicates that the residential heat storage systems are not fully commercial in their present state for use as a load management option and the technology requires further development. DOE

N82-32885# SRI International Corp., Menlo Park, Calif.
HYDROCARBON REFORMING FOR HYDROGEN FUEL CELLS: A STUDY OF CARBON FORMATION ON AUTOTHERMAL REFORMING CATALYSTS Final Report
J. G. McCarty, D. M. Sheridan, H. Wise, and B. J. Wood Dec. 1981 157 p refs
(Contract DE-AC21-79MC-11323)
(DE82-010461; DOE/MC-11323/T2) Avail: NTIS HC A08/MF A01

The mechanism of carbon formation on nickel autothermal steam reforming catalysts was studied by temperature programming, thermogravimetric and electron microscopic techniques. Temperature programmed surface reaction (TPSR) studies of carbon deposited on nickel reforming catalysis by the decomposition of C2H4 and C2H2 exhibit seven forms of carbon that are distinquished by their characteristic reactivity with H2 and 3.0-vol % H2O/He. Similar carbon states are found on all nickel catalysts including Ni/(BETA)-Al2O3 and Ni/MgO-Al2O3 which suggests that the support has little effect on carbon deposit formation and reactivity. The reactivity of the carbon states is not altered by exposure to steam in C2H4-H2O mixtures, but the amount of carbon desposited decreases to zero as H2O/C increases past a critical ratio. DOE

N82-32886# Sandia Labs., Albuquerque, N. Mex.
INTERMEDIATE PHOTOVOLTAIC SYSTEM APPLICATION EXPERIMENT OPERATIONAL PERFORMANCE, EXECUTIVE SUMMARY. VOLUME 3. BERVERLY HIGH SCHOOL, BEVERLY, MASSACHUSETTS
Jan. 1982 17 p Prepared in cooperation with Boeing Computer Services, Inc., Seattle
(Contract DE-AC04-76DP-00789)
(DE82-009297; SAND-81-7102-Vol-3) Avail: NTIS HC A02/MF A01

Performance data for the months of November and December, 1981 are given for a utility connected 100 kW solar photovoltaic flat panel power system at a Massachusetts school building. Data given include monthly and daily energy produced, monthly and daily solar energy incident on the collectors, monthly array efficiency, monthly power conditioner efficiency, monthly system efficiency, monthly capacity factor, and monthly average insolation. Also included are a plot of data acquisition mode and recording interval for each day of each month, and a malfunction report regarding the data acquisition system. DOE

N82-32887# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
PHASE 1 DEVELOPMENT OF AN AQUIFER HEAT STORAGE FACILITY. PART 1: SUMMARY AND RESULTS Final Report, Feb. 1980
Anton Harasim and Bertrand Weissenbach Bonn Bundesministerium fuer Forschung und Technologie Mar. 1982 189 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-032-pt-1; ISSN-0340-7608) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 35,40

A surface aquifer pilot plan was defined. Several versions of construction were drafted and the costs were calculated for variable site conditions. Aquifer heat storage facilities larger than 5,000 cu m (water equivalent) are cheaper than any known storage concept. Simultaneous with technical and economic studies, problems of chemical mass transport in two typical soil materials (calcareous gravel water and red marl water) were investigated in lab tests. Special attention was paid to the biological behavior of a wet gravel bed in view of the possibility of clogging by slime. Recommendations are given to ensure safe operation of the storage plant. Corrosion in the storage facility was considered for various materials. Results show that cement structures are preferred. Author (ESA)

N82-32888# Maschinenfabrik Augsburg-Nuernberg A.G., Oberhausen (West Germany).
LIQUEFIED NATURAL GAS VAPORIZATION AND ELECTRICITY GENERATION, USING CLOSED CYCLE GAS TURBINES Final Report, Jun. 1981
Dieter Weber and Manfred Waloch Bonn Bundesministerium fuer Forschung und Technologie Mar. 1982 352 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-035; ISSN-0340-7608) Avail: NTIS HC A16/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 49,60

The energy released during the vaporization of liquefied natural gas (LNG), which represents an annual potential for thermal power that amounts to 1 500 MW worldwide, was investigated. A plant was developed for LNG vaporization and electricity generation using closed cycle gas turbines for the economic utilization of this energy. The following design data are given: LGN mass flow (101.1 kg/sec); natural gas volumetric flowrate (STP: 431,410 cu m/hr); power at terminals (100 MW); fuel consumption (natural gas: 16,070 cu m/hr); efficiency at terminals (55%); and total utilization (electricity plus LNG vaporization heat: 93%).
Author (ESA)

N82-32889# Bayer A.G., Leverkusen (West Germany). Zentralbereich Forschung und Entwicklung.
DEVELOPMENT OF FLUORESCENT SYSTEMS FOR USE IN DISPLAYS AND SOLAR CELLS Final Report, Jun. 1980
Uwe Claussen Bonn Bundesministerium fuer Forschung und Technologie Apr. 1982 26 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-045; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5,50

The use of dyes with very high light purity when demands on luminescence are not particularily high is discussed. These compounds are of limited value for collecting scattered light, because extreme light purity as well as extreme luminescence are required. A perylene derived dye with good luminescence properties, but poor light purity, was synthesized. The optimization of the system dye/polymer is necessary. Analytical methods based on ultra fast spectroscopy are introduced. Dyestuffs that are commercialized as light collecting plastics are presented.
Author (ESA)

N82-32890# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Raumfahrt.
THE GERMAN CONTRIBUTION TO THE 1 MW (el) SOLAR TOWER POWER PLANT OF THE EUROPEAN COMMUNITY: EURELIOS, PHASE C Final Report, Mar. 1981
Jochen Hofmann and Eckart Schober Bonn Bundesministerium

fuer Forschung und Technologie Apr. 1982 54 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-82-047; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 11,40

The installation and acceptance of a heliostat field are described. System engineering of the whole plant is discussed and start-up, initiated by stepwise experimentation and operation of the subsystems, is treated. The complete system was operated, first under simulated conditions, then in solar operational mode. Results, obtained over a period of several months, prove the functional integrity of the heliostat field under quasi operational conditions. Author (ESA)

N82-32891# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Raumsimulation.
VALIDATION OF SOLAR COLLECTOR MEASUREMENTS UNDER NATURAL AND SIMULATED CONDITIONS Ph.D. Thesis - Ruhr Univ.
Wilfried Ley Jun. 1981 191 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-775)
(DFVLR-FB-82-05; ESA-TT-775) Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 59,40

The performance characteristics, heat losses, azimuthal angular dependence and effects of different environmental parameters were determined for low temperature flat plate solar collectors, under natural and simulated conditions. Results indicate that outdoor tests can be replaced by indoor measurements, using a simplified solar simulator and a climatic chamber. Author (ESA)

N82-32892# Miller Communications Systems Lts., Kanata (Ontario).
TECHNICAL AND PERFORMANCE CHARACTERISTICS OF GPS/NAVSTAR
B. A. Mazur and E. Wong Paris ESA Feb. 1982 212 p refs 2 Vol.
(Contract ESTEC-4631/81/F-RD(SC))
(MCS-8137-Vol-2; ESA-CR(P)-1601-Vol-2) Avail: NTIS HC A10/MF A01

Technical and performance characteristics of the Global Positioning system relevant to a feasibility assessment of a similar civilian system are summarized. The NAVSTAR satellite, control segment, navigation signal structure, receiver performance, downlink power budget, receiver computations and navigation message, and error performance are covered. Author (ESA)

N82-32893# United Nations Economic Commission for Europe, Geneva (Switzerland).
COMPENDIUM ON LOW AND NON-WASTE TECHNOLOGY, MONOGRAPHS 1-20
Feb. 1982 289 p Partly in FRENCH, RUSSIAN and ENGLISH Sponsored in part by EPA
(PB82-166976; ECE/ENV/36) Avail: NTIS HC A13/MF A01 CSCL 10A

Process technologies which reduce or eliminate wastes and reduce energy usage are described. The low and nonwaste technologies are described and compared to the conventional technologies that were replaced. GRA

N82-32894# United Nations Economic Commission for Europe, Geneva (Switzerland).
COMPENDIUM ON LOW AND NON-WASTE TECHNOLOGY, MONOGRAPHS 21-46
Feb. 1982 285 p In ENGLISH, FRENCH and RUSSIAN Sponsored in part by EPA
(PB82-166984) Avail: NTIS HC A13/MF A01 CSCL 10A

The monographs contain descriptions of process technologies which reduce or eliminate wastes and reduce energy usage. The low and non-waste technologies are described and compared to the conventional technologies that have been replaced. GRA

N82-32549*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RATES OF SOLAR ANGLES FOR TWO-AXIS CONCENTRATORS
C. S. Yung and F. L. Lansing *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 200-211 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 10A

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N82-32895 Defence Research Information Centre, Orpington (England).
APPLICATION OF THE GLASSY CARBON ELECTRODE TO THE DETERMINATION OF MECURY IN RIVER WATER BY MEANS OF DIFFERENTIAL-PULSE ANODIC STRIPPING VOLTAMMETRY (DPASV)
Konstantin Kritsotakis, Norbert Laskowski, and Heinz Jurgen Tobschall Jun. 1982 17 p refs Transl. into ENGLISH from Intern. J. Environ. Anal. Chem., (West Ger.), v. 6, 1979 pp 203-216
(DRIC-T-6636; BR83702) Copyright. Avail: Issuing Activity

The glassy carbon electrode was used to determine mercury by stripping voltammetry in synthetic solutions and river water. A supporting electrolyte with the composition 0.1M KSCN, 0.025N HCl and 20 ng/ml Cu 2+ was satisfactory for the determination. The optimum pH value is found to be 2.8, and the optimum electrolyzing voltage - 1.0 V. Mercury can be determined down to a concentration of 1.5ppb in natural water samples Author (ESA)

N82-32896 Defence Research Information Centre, Orpington (England).
REMOTE FLUOROMETRY FOR DETECTING OIL SLICKS ON THE OCEAN SURFACE
V. Y. Maslov and M. N. Nesterova Jun. 1982 11 p refs Transl. into ENGLISH from Metody Issled. Org. Veshchestva Okeane (USSR), 1980 pp 262-269
(DRIC-T-6657; BR83700) Copyright. Avail: Issuing Activity

Remote fluorometry, i.e., exposing the investigated surface of water to a flow of UV light causing the slick to fluorescence is introduced. Stimulation spectra obtained by the method at 330 to 380 nm and fluorescence spectra at 400 to 500 nm were measured for 14 crudes, 4 oil fractions, 14 commercial oils and 4 fuels in decane at concentrations of 0.001 to 0.0001 g/ml and as oil slicks applied to the surface of sea water. The data were used to analyze remote fluorescence spectra of oil slicks in the Arctic and Pacific Oceans to a minimum thickness of 0.1 to 0.2 microns. In the Sea of Japan, 10 % of the surface is covered by oil slicks. Author (ESA)

N82-32897# National Marine Fisheries Service, Seattle, Wash.
ANALYSIS OF RESIDUAL CHLORINATED HYDROCARBONS, AROMATIC HYDROCARBONS AND RELATED COMPOUNDS IN SELECTED SOURCES, SINKS AND BIOTA OF THE NEW YORK BIGHT Technical Memorandum, Jun. 1977 - Oct. 1979
William D. MacLeod, Jr., L. Scott Ramos, Andrew J. Friedman, Douglas G. Burrows, Patty G. Prohaska, David L. Fisher, and Donald W. Brown Boulder, Colo. May 1981 133 p refs
(NOAA-TM-OMPA-6) Avail: NTIS HC A07/MF A01

Analytical procedures including materials, water, sewage sludge, biota, sediment, extract filtration and preliminary clean up, liquid chromatography, gas chromatography (GC) and mass spectrometry (MS) are reported. More than 250 samples of the New York Bight were analyzed. Selected samples, representing 10 substrates, were intensively analyzed by GC/MS for whatever additional compounds could be identified. Results are tabulated. Author

N82-32898# Pearson and Associates, Springfield, Va. Office of Marine Pollution Assessment.
NEW YORK BIGHT PROJECT: TECHNICAL DEVELOPMENT PLAN FOR FISCAL YEAR 1981
Boulder, Colo. May 1981 91 p refs
(T-245) Avail: NTIS HC A05/MF A01

The condition of the New York Bight ecosystem was determined and significant environmental problems were identified. A comprehensive understanding of the processes and interrelationships of the ecosystem, was developed, and the effects of pollutants and other human related stresses on the New York Bight were determined. S.L.

N82-32899*# Southwest Research Inst., San Antonio, Tex.
ASSESSMENT OF BURNING CHARACTERISTICS OF AIRCRAFT INTERIOR MATERIALS
A. F. Grand and A. J. Valys Apr. 1981 203 p refs
(Contract NAS2-10148)
(NASA-CR-166390; NAS 1.26:166390; Rept-01-5584) Avail: NTIS HC A10/MF A01 CSCL 01C

The performance of a series of seat cushion design constructions was compared based on their heat and smoke release characteristics. Tests were conducted in a room size calorimeter instrumented for measuring weight loss, rate of heat release, smoke and volatile decomposition products and the cumulative energy release. Baseline data were obtained from burn tests conducted on commercial airline salvage sets as a comparison with more advanced seat designs. A toxicological assessment of smoke and fire gases involved the exposure of test animals and their biological responses ascertained. Relative toxicological hazards of the combustion gases are discussed based on the animal response studies and the analysis of the combustion gases. Author

N82-32900*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GLOBAL CHANGES: IMPACTS ON HABITABILITY. A SCIENTIFIC BASIS FOR ASSESSMENT
Richard Goody 7 Jul. 1982 19 p Presented at the Workshop held at Woods Hole, Mass., 21-26 Jun. 1982
(NASA-CR-169174; JPL-D-95; NAS 1.26:169174) Avail: NTIS HC A02/MF A01 CSCL 13B

The feasibility of a major NASA research initiative to document, to understand, and if possible, to predict long-term (5 to 50 years) global changes that can affect the habitability of the Earth is addressed. The major factor contributing to change is human activity. The program discussed involves studies of the atmosphere, oceans, land, the cryosphere, and the biosphere. On decadal time scales, these regimes and the cycles of physical and chemical entities through them are coupled into a single interlocking system. Some part of this system can be studied in a straightforward manner (the atmosphere) and some with great difficulty (the biosphere). J.M.S.

N82-32901# Committee on Environment and Public Works (U. S. Senate).
THE EFFECT OF CHLOROFLUOROCARBONS ON THE OZONE LAYER
Washington GPO 1981 366 p refs Hearing before the Subcomm. on Toxic Substances and Environ. Oversight of the Comm. on Environ. and Public Works, 97th Congr., 1st Sess., 23 Jul. 1981
(GPO-85-886) Avail: Subcommittee on Toxic Substances and Environmental Oversight

The status of scientific inquiry and knowledge about the effect of chlorofluorocarbons on the stratospheric ozone layer and the effect of increased doses of ultraviolet radiation on the human body is investigated. Several alternatives are presented with respect to the regulation of chlorofluorocarbons. S.L.

N82-32902# California Univ., Los Angeles. Lab. of Biomedical and Environmental Sciences.
EFFECT OF SEVERAL THERMAL TRANSFER/STORAGE FLUIDS ON BARLEY SEED GERMINATION AND SEEDLING GROWTH
H. Nishita and R. M. Haug Sep. 1981 48 p refs
(Contract DE-AM03-76SF-00012)
(UCLA-12-1315) Avail: NTIS HC A03/MF A01

Plant toxicity threshold level of used thermal transfer/storage materials (Therminol 66, Caloria HT43, Syltherm 800, and Partherm 430) in four different soils was determined by using a modified Neubauer technique. The plant toxicity threshold level of toluene, which is a leading candidate for engine working fluid, was also determined. In three of the soils (Aiken c.l., Yolo c.l., and Egbert muck), the material tolerated in the least amount was Syltherm 800 and that tolerated in the greatest amount was Caloria HT43. In the fourth soil (Soil JF79), the material tolerated in the least and in the greatest amounts was Partherm 430 and toluene, respectively. Some chemical analyses of thermal transfer/storage materials were also done. Free fatty acids and organic peroxides contents of the used oils were very low, indicating that the heating to which the oils were subjected did not cause appreciable oxidation. Exposure to natural elements (direct solar radiation, ambient air and temperature) for an extended period of time (up to 2 months) appeared to cause more oxidation of the oils than heating alone. Author

N82-32903# Department of Energy, New York. Environmental Measurements Lab.
PROGRAMS OF THE REGIONAL BASELINE STATION, CHESTER, NEW JERSEY
Herbert L. Volchok, ed. Nov. 1981 351 p refs
(DE82-010504; DOE/EML-399) Avail: NTIS HC A02/MF A01

Research programs conducted at the Regional Baseline Station at Chester, NJ during 1981 are reported. Data are presented on chemical air pollutants and background radiation. Items within the scope of EDB have been entered individually into the data base. DOE

N82-32904# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
ROLE OF THE BIOSPHERE IN THE CARBON CYCLE
J. S. Olson 1981 17 p refs Presented at the Intern. Conf. on Energy Use Management-3, West Berlin, 26 Oct. 1981
(Contracts W-7405-eng-26; DE-AC05-76OR-00033; Grant NSF DEB-77-26722)
(DE82-002886; CONF-811006-6; ESD-Publ-1815; ORNL-CONTRIB-81-22) Avail: NTIS HC A02/MF A01

Analyses of ecosystem areas, carbon inventories and exchange rates confirm that biospheric processes affecting atmospheric CO_2 have been important but changeable. Only part of the world's land ecosystems has been a net source to the atmosphere and perhaps only during parts of the past century. Simultaneously, some land ecosystems (especially Temperate and Boreal) and perhaps freshwater and near shore marine ecosystems (with their sediments) recently have become net sinks for much of the carbon that cannot be accounted for by present models of absorption in the open ocean. Hence, the net contribution of nonfossil carbon to the atmospheric CO_2 was probably significantly smaller than the prompt atmospheric inputs from forest clearing and burning, global shifts from woody to nonwoody vegetation, and delayed CO_2 inputs related to transfers from slowly to rapidly decomposing debris and humus. Inputs from fossil fuels now appear mainly responsible for the clear increase in excess CO_2 recorded by global monitoring since 1958. DOE

N82-32905# California Univ., Livermore. Lawrence Livermore Lab.
REPORT OF LAWRENCE LIVERMORE NATIONAL LABORATORY TO THE ENVIRONMENTAL PROTECTION AGENCY ON RESEARCH SINCE DECEMBER, 1979 Report, 1 Dec. 1979 - 1 Oct. 1981
Donald J. Wuebbles, Julius S. Chang, Frederick M. Luther, Joyce E. Penner, and Raymond L. Tarp Oct. 1981 18 p refs
(Contract W-7405-eng-48)
(DE82-001621; UCID-19221) Avail: NTIS HC A02/MF A01

Stratospheric ozone and man's potential influence on it are discussed. Primary research emphasis was on the numerical

modeling of atmospheric chemical and physical processes, and assessments of the atmospheric response to stratospheric perturbations. The potential influence of chlorofluorocarbons on stratospheric ozone was of particular concern. The basic research tool in these investigations was one dimensional coupled transport and chemical kinetics model of the troposphere and stratosphere. Each of the research tasks is described. DOE

N82-32906# Public Service Electric and Gas Co., Newark, N. J.
FIELD EVALUATION OF CHLORINE MONITORING TECHNIQUES Final Report
R. Sugam, W. Swallow (North Carolina State Univ., Raleigh), and J. Trout (Rutgers Univ.) Oct. 1981 102 p refs
(EPRI Proj. 879-1)
(DE82-900872; EPRI-EA-2070) Avail: NTIS HC A06/MF A01

The results of a field evaluation of four different analytical methods for total residual chlorine are presented. The methods were seleted as most suitable for power plants applications in an earlier laboratory study. The methods tested were: manual amperometric titration; auomatic amperometric titration; amperometric back titration; and chlorine flux monitor. The study was conducted at three field sites covering a range of water qualities, including freshwater, brackish water, and seawater. It should be noted that, because water quality influences the reactions of chlorine and the analytical procedures for measuring oxidants, the resIts reported here are site-specific and are not necessarily applicable to other areas. No natural oxidant background was detected at any of the sites. Sample integrity cound not be maintained by the fixation procedures used for the forward or back titrations. Sample instability was greatest in seawater where brominated oxidants dominated. DOE

N82-32907# BKI Associates, Inc., McLean, Va.
STUDY OF THE COST EFFECTIVENESS OF STATIONARY SOURCE, MOBILE SOURCE AND TRANSPORTATION CONTROLS TO IMPROVE AIR QUALITY Final Report, Sep. 1979 - Nov. 1981
Salvatore J. Bellomo and Joe Mehra Nov. 1981 210 p Prepared in cooperation with Energy and Environmental Analysis, Inc.
(Contract DOT-OS-90088)
(PB82-167750; BKI-J-143(02)) Avail: NTIS HC A10/MF A01 CSCL 13B

A cost effectiveness analysis of stationary source, mobile source and transportation controls to improve air quality is presented. The methodology consists of five steps: adjust emission inventories, determine the initial list of controls, determine direct costs and emission reduction, determine other effects (user costs, socio-economic, other environment, etc.), and evaluate control strategies using a least cost model. The application of the methodology for evaluating hydrocarbon emissions showed that although stationary source controls were more effective in reducing hydrocarbon emissions, most of the transportation controls were more cost effective even though their direct effect on reducing hydrocarbon emissions was not that great. GRA

N82-32908# Northrop Services, Inc., Research Triangle Park, N.C. Environmental Sciences Div.
ACIDIFICATION OF RAIN IN THE PRESENCE OF SO2, H2O2, O3, AND HNO3
John H. Overton and Jack L. Durham (EPA, Research Triangle Park, N.C.) Jan. 1982 27 p refs
(PB82-167206; EPA-600/D-82-150) Avail: NTIS HC A03/MF A01 CSCL 13B

The production of acid sulfate and the accumulation of acid nitrate are calculated for falling raindrops using a physico-chemical model that accounts for the mass transfer of SO2, H2O2, O3, HNO3, and CO2. The acidification is postulated to occur through the absorption of free gaseous HNO3 and the absorption and reaction of SO, H2O2 and O3 to yield H2SO4. The relative effectiveness of H2O2(aq) and O3(aq) for oxidizing SO2(aq) in acidifying raindrops and influencing SO4(-2) formation are investigated. Results indicate: that H2O2 is more effective that O3, HNO3 inhibits SO4(-2) formation due to O3 oxidation; and in all cases, HNO3 is important in acidifying rain. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N82-32909*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SATELLITE TRACKING AND EARTH DYNAMICS RESEARCH PROGRAMS Semiannual Progress Report, 1 Jan. - 30 Jun. 1982
Aug. 1982 102 p refs
(Grant NGR-09-015-002)
(NASA-CR-169305; NAS 1.26:169305; SAPR-46) Avail: NTIS HC A06/MF A01 CSCL 08G

The SAO laser site in Arequipa continued routine operations throughout the reporting period except for the months of March and April when upgrading was underway. The laser in Orroral Valley was operational through March. Together with the cooperating stations in Wettzell, Grasse, Kootwikj, San Fernando, Helwan, and Metsahove the laser stations obtained a total of 37, 099 quick-look observations on 978 passes of BE-C, Starlette, and LAGEOS. The Network continued to track LAGEOS at highest priority for polar motion and Earth rotation studies, and for other geophysical investigations, including crustal dynamics, Earth and ocean tides, and the general development of precision orbit determination. The Network performed regular tracking of BE-C and Starlette for refined determinations of station coordinate and the Earth's gravity field and for studies of solid earth dynamics. Monthly statistics of the passes and points are given by station and by satellite. J.M.S.

N82-32910# Joint Publications Research Service, Arlington, Va.
USSR REPT.: EARTH SCIENCES, NO. 21
1 Jun. 1982 58 p refs Transl. into ENGLISH from various Russian articles
(JPRS-80950) Copyright. Avail: NTIS HC A04

Soviet meteorological, oceanographic, and geophysical research activities are reported. For individual titles, see N82-32911 through N82-32912.

N82-32911# Joint Publications Research Service, Arlington, Va.
THEORETICAL PROBLEMS IN OCEANIC GEOLOGY
A. V. Peyve and Yu. M. Pushcharovskiy *In its* USSR Rept.: Earth Sci., No. 21 (JPRS-80950) 1 Jun. 1982 p 21-33 refs Transl. into ENGLISH from Priroda (Moscow), no. 1, Jan. 1982 p 30-41 (For primary document see N82-32910 23-46)
Copyright. Avail: NTIS HC A04

Various expeditions to collect data on the relief of the ocean floor are reviewed. The principal structural categories of the Earth are summarized. Mobilism, as an explanation of continental drift, is reviewed. The formation of oceans is discussed. N.W.

N82-32912# Joint Publications Research Service, Arlington, Va.
SOVIET UNION PROGRAM FOR STUDY OF EARTH'S DEEP LAYERS
V. V. Belousov *In its* USSR Rept.: Earth Sci., No. 21 (JPRS-80950) 1 Jun. 1982 p 37-50 Transl. into ENGLISH from Priroda (Moscow), no. 1, Jan. 1982 p 3-13 (For primary document see N82-32910 23-46)
Avail: NTIS HC A04

The Earth's crust and upper mantle, which together are usually called the tectonosphere, were investigated toward the goal of expanding the Soviet base of earth resources. The structure of the tectonosphere and methods for its investigation are discussed. The Kola borehole and a program of superdeep drilling are reviewed. Geonomy, denoted as the integrated science of the Earth, is also discussed. N.W.

N82-32913*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A TECHNIQUE FOR DETERMINING DAYTIME ATMOSPHERIC OXIDE ABOVE 50 km FROM BACKSCATTERED ULTRAVIOLET MEASUREMENTS
R. D. Guenther, R. D. McPeters, and J. E. Frederick Jul. 1979 23 p refs
(NASA-TM-80325; NAS 1.15:80325) Avail: NTIS HC A02/MF A01 CSCL 04A

Airglow from gamma band resonance fluorescence of nitric oxide near 255 nm is calculated at several solar zenith angles. Data from the Nimbus 4 BUV wavelengths 273.5 to 287.6 nm is used to estimate the Rayleigh and ozone scattering contributions to the BUV 255.5 nm data and the remaining signal is attributed to NO airglow. The low solar zenith angle contributions by NO is less than 0.5%, and the high latitude/high zenith angle contribution exceeds 5%. This technique allows for estimating NO content above 50 km, as well as partitioning that content between the mesosphere and thermosphere. Author

N82-32914*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LOW-LEVEL WATER VAPOR FIELDS FROM THE VISSR ATMOSPHERIC SOUNDER (VAS) SPLIT WINDOW CHANNELS AT 11 AND 12 MICRONS
D. Chesters, L. Uccellini, and W. Robinson 7 May 1982 36 p refs Original contains color illustrations
(NASA-TM-83951; NAS 1.15:83951) Avail: NTIS HC A03/MF A01 CSCL 04A

A series of high-resolution water vapor fields were derived from the 11 and 12 micron channels of the VISSR Atmospheric Sounder (VAS) on GOES-5. The low-level tropospheric moisture content was separated from the surface and atmospheric radiances by using the differential adsorption across the 'split window' along with the average air temperature from imbedded radiosondes. Fields of precipitable water are presented in a time sequence of five false color images taken over the United States at 3-hour intervals. Vivid subsynoptic and mesoscale patterns evolve at 15 km horizontal resolution over the 12-hour observing period. Convective cloud formations develop from several areas of enhanced low-level water vapor, especially where the vertical water vapor gradient relatively strong. Independent verification at radiosonde sites indicates fairly good absolute accuracy, and the spatial and temporal continuity of the water vapor features indicates very good relative accuracy. Residual errors are dominated by radiometer noise and unresolved clouds. Author

N82-32915*# Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology and Physical Oceanography.
REPORT OF WORKSHOP ON MOUNT SAINT HELENS: ITS ATMOSPHERIC EFFECTS AND POTENTIAL CLIMATIC IMPACT
Reginald E. Newell, ed. and Adarsh Deepak, ed. (Inst. for Atmospheric Optics and Remote Sensing) 1982 141 p refs Workshop held in Washington, D.C., 20-21 Nov. 1980; sponsored by Inst. for Atmospheric Optics and Remote Sensing Original contains color illustrations
(Contract NAS1-16454)
(NASA-SP-458; NAS 1.26:458; LC-82-8005) Avail: NTIS MF A01; SOD HC $6.00 CSCL 08K

The atmospheric and potential climatic aspects of a volcanic eruption were discussed. Measurements and techniques used in collecting the data are summarized. S.L.

N82-32916# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SPREAD F PLASMA BUBBLE VERTICAL RISE VELOCITIES DETERMINED FROM SPACED IONOSONDE OBSERVATIONS
M. A. Abdu, R. T. deMedeiros, J. H. A. Sobral, and J. A. Bittencourt May 1982 22 p refs Submitted for publication Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Technologico
(INPE-2416-PRE/124) Avail: NTIS HC A02/MF A01

Systematic time differences in the onsets of spread F events in the ionograms are observed. Close to a common magnetic meridional plane. On the assumption, justified from different experimental observations, that the spread F irregularities occur in strongly field aligned plasma bubbles extending several degrees on either side of the magnetic equator, the observed time differences in the onsets of spread F events at the two stations were related to the plasma bubble vertical rise velocities over the magnetic equator. The vertical rise velocities of the plasma bubble so determined are found to be well within the values measured by VHF radar and satellite techniques, and further show, at times, good correlation with the amplitude of the prereversal peak in the vertical drift velocities and the heights of the evening equatorial F layer. Possible implications of these results are discussed. Author

N82-32917# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ON THE LOW LATITUDE MERIDIONAL SCANNING PHOTOMETER SIGNATURES OF THE EQUATORIAL IONOSPHERE PLASMA BUBBLES
M. A. Abdu and J. H. A. Sobral Jun. 1982 18 p refs Submitted for publication
(INPE-2432-PRE/136) Avail: NTIS HC A02/MF A01

Equatorial ionosphere plasma bubble dynamics were studied using meridional as well as east-west scanning airglow photometer measurements over Cachoeira Paulista in Brazil. The east-west displacements of the 6300 angstrom airglow intensity valleys could, in a rather straightforward way, represent an east-west velocity of the plasma bubble in the equatorial plane due to the large north-south extension of the plasma bubble. However, the interpretation of the meridional displacement of the airglow valleys as representing vertical rise velocity of the plasma fact, involve considerations also of the limited east-west extension of the bubble as well as the westward tilt (in the equatorial plane), often observed, of the plasma bubble. Possible influences of these factors on the interpretation of the meridional scan data to infer dynamics of the plasma bubble in the equatorial ionosphere are considered. Author

N82-32918# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A COMPARATIVE STUDY OF VHF SCINTILLATION AND SPREAD F EVENTS OVER NATAL AND FORTALEZA IN BRAZIL
R. T. deMedeiros, M. A. Abdu, and I. J. Kantor Jul. 1982 26 p refs Presented at the 1982 SBPC Meeting, Campinas, Brazil Submitted for publication
(INPE-2469-PRE/158) Avail: NTIS HC A03/MF A01

The equatorial ionospheric irregularity occurences, as observed by range spread F events over Fortaleza (4 deg S, 38 deg W, dip latitude 1.8 deg) and satellite VHF signal scintillation events over Natal (5.8 deg S, 33.23 deg W, dip latitude 4.8 deg S) for a one year period were studied. Close association is observed in the occurrences and the durations of the irregularities at the two stations. Marked differences in the seasonal behavior of the occurrences of the irregularity events over these two stations are noted with respect to that over Huancayo, most important of them being that while the latter station presents equinoctial maxima in the occurrence rates (as over some African stations), the Brazilian stations show an additional and pronounced peak in December. This result is explained as possible evidence of magnetic declination control of the spread F irregularity generation. The results have important implications on the coexistence of different irregularity scale sizes during equatorial plasma bubble irregularity events. S.L.

N82-32919# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
COMPLEXITIES OF THE STORM TIME CHARACTERISTICS OF IONOSPHERIC TOTAL ELECTRON CONTENT
R. P. Kane Apr. 1982 12 p refs Submitted for publication Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico

(INPE-2381-PRE/106) Avail: NTIS HC A02/MF A01

The complexities of the storm-time variations of the ionospheric total electron content (TEC) are briefly reviewed. It is suggested that large variations from storm to storm may be due to irregular flows from the auroral region towards equator. A proper study of such flows needs an elaborate network of TEC measuring instruments. The need of planning and organizing such a network is emphasized. Author

N82-32920# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

PARTICLE PRECIPITATION IN THE IONOSPHERIC F2 REGION AT LOCATIONS IN THE VICINITY OF THE SOUTH ATLANTIC ANOMALY

Rajaram Purushottam Kane Nov. 1981 20 p refs Submitted for publication

(INPE-2257-PRE/039) Avail: NTIS HC A02/MF A01

The f sub 0 F sub 2 daily variation characteristics were compared for IGY equinox months for pairs of stations at roughly similar dip angles. One station in each pair was in the South African continent and another in the South-American continent. It was found that locations on the west coast of South Africa showed larger f sub 0 F sub 2 in the afternoon hours as compared to locations on the east coast of South America. It is suggested that at least a part of this excess may be due to particle precipitation effects in the South African region which may be nearer to the center of the South Atlantic particle precipitation anomaly. Author

N82-32921# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

GEOMAGNETIC MEASUREMENTS AT EUSEBIO, FEBRUARY 1975 - NOVEMBER 1977

Elesbao Grigorio deSouza, Jose Marques daCosta, and Nalin Babulal Trivedi Jul. 1982 199 p refs

(INPE-2477-RPE/413) Avail: NTIS HC A09/MF A01

The total geomagnetic field intensity measurements at Eusebio, Ceara, Brazil are presented. Hourly mean values are given in the form of tables; computerized plots show the daily variations. The monthly mean values for quiet days are also presented. An optical pumping rudibium vapor magnetometer was used. The operation of the magnetometer is explained. S.L.

N82-32922# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

THE ATMOSPHERIC NEUTRAL SODIUM LAYER, 2, DIURNAL VARIATIONS

V. W. J. H. Kirchhoff and B. R. Clemesha May 1982 32 p refs Submitted for publication Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Tecnologico

(INPE-2415-PRE/123) Avail: NTIS HC A03/MF A01

Static calculations simulating the nocturnal sodium layer are shown to give results in good agreement with an average of sodium measurements. In order to further evaluate this Na layer model, a dynamic time dependent atmospheric photochemistry-vertical diffusion model was developed to calculate the diurnal variation of sodium and compare it with recent measurements. The diurnal calculations show that the Na model fails to reproduce the measured diurnal behavior of the Na layer, which, for example, shows little variation in abundance between day and night. After a thorough review of the reaction rates it is shown that the major modification which needs to be introduced with respect to the previous model is the elimination of the reaction NaOH+H yields Na+H2O. The production of the NaOH molecule is thus effectively transformed into a height dependent sink for Na. The sensitivity of the new model is tested for variations of the reaction rates and the eddy diffusion coefficient and the results are shown to be in much better agreement with experiment. Author

N82-32923*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

AN EFFICIENT ROUTINE FOR INFRARED RADIATIVE TRANSFER IN A CLOUDY ATMOSPHERE

Ming-Dah Chou and Louis Kouvaris Oct. 1981 50 p refs

(NASA-TM-83830; NAS 1.15:83830) Avail: NTIS HC A03/MF A01 CSCL 04A

A FORTRAN program that calculates the atmospheric cooling rate and infrared fluxes for partly cloudy atmospheres is documented. The IR fluxes in the water bands and the 9.6 and 15 micron bands are calculated at 15 levels ranging from 1.39 mb to the surface. The program is generalized to accept any arbitrary atmospheric temperature and humidity profiles and clouds as input and return the cooling rate and fluxes as output. Sample calculations for various atmospheric profiles and cloud situations are demonstrated. S.L.

N82-32924*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

OBSERVATION AND MODELING OF ENERGETIC PARTICLES AT SYNCHRONOUS ORBIT ON JULY 29, 1977

D. N. Baker (LASL, N. Mex.), P. R. Higbie (LASL, N. Mex.), T. A. Fritz (Space Environment Lab.), B. Wilken (Max-Planck-Inst. fuer Aeronomie, Katlenburg-Lindau, West Germany), S. M. Kaye (Lockheed Missiles and Space Co., Palo, Alto, Calif.), M. G. Kivelson (California Univ., Los Angeles), T. E. Moore (New Hampshire Univ., Durham), A. J. Masley (TRW Systems, Redondo Beach, Calif.), P. H. Smith, and A. L. Vampola (Aerospace Corp., El Segundo, Calif.) 16 Aug. 1982 58 p refs Presented at the SCOSTEP/IAGA Symp. on the Intern. Magnetospheric Study, Melbourne, Nov. 1979

(Contract F4701-81-C-0082; Grant NSF ATM-79-23586)

(NASA-TM-84115; NAS 1.15:84115; SD-TR-82-56; AC-TR-0082(2940-05)-7) Avail: NTIS HC A04/MF A01 CSCL 03B

In the twelve hours following a worldwide storm, there was a series of at least four magnetospheric substorms, the last and largest of which exhibited an expansion phase onset at approximately 1200 UT. Data from six spacecraft in three general local time groupings (0300, 0700, and 1300 LT) were examined and vector magnetic field data and energetic electron and ion data from approximately 15 keV to > 2 MeV were employed. S.L.

N82-32925*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.

HIGH LATITUDE ELECTROMAGNETIC PLASMA WAVE EMISSIONS

Donald A. Gurnett May 1982 50 p refs Presented at the Nobel Symp. on High Latitude Space Plasma Phys., Kiruna, Sweden, 22-25 Mar. 1982

(Contracts NAS5-26819; NAS5-25690; Grants NGL-16-001-002; NGL-16-001-043)

(NASA-CR-169232; NAS 1.26:169232; AD-A115788; CU-OF-IOWA-82-9) Avail: NTIS HC A03/MF A01 CSCL 20/9

The principal types of electromagnetic plasma wave emission produced in the high latitude auroral regions are reviewed. Three types of radiation are described: auroral kilometric radiation, auroral hiss, and Z mode radiation. Auroral kilometric radiation is a very intense radio emission generated in the free space R-X mode by electrons associated with the formation of discrete auroral arcs in the local evening. Theories suggest that this radiation is an electron cyclotron resonance instability driven by an enhanced loss cone in the auroral acceleration region at altitudes of about 1 to 2 R sub E. Auroral hiss is a somewhat weaker whistler mode emission generated by low energy (100 eV to 10 keV) auroral electrons. The auroral hiss usually has a V shaped frequency time spectrum caused by a frequency dependent beaming of the whistler mode into a conical beam directed upward or downward along the magnetic field. GRA

N82-32926# General Dynamics/Convair, San Diego, Calif.

REMOTE INFRARED ATMOSPHERIC PROFILING SYSTEM (RIAPS) Final Report, 28 Apr. 1975 - 30 Jan. 1981

C. R. Claysmith May 1982 20 p refs

(Contract N00014-75-C-0940; NR Proj. 211-196)

(AD-A115884; GDC-CRAD-82-0940) Avail: NTIS HC A02/MF A01 CSCL 17/5

This report describes the development of an infrared sensor

operating in the 11 to 20 micron region using computerized inversion programs to yield temperature and water vapor profiles of the Earth's atmosphere up to 6 km. The development of the sensor system hardware and software is summarized for the period 1975 through 1981. Atmospheric profiles acquired and processed are presented. Author (GRA)

N82-32927*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
AURORAL HISS, Z-MODE RADIATION AND AURORAL KILOMETRIC RADIATION IN THE POLAR MAGNETOSPHERE: DE-1 OBSERVATIONS Progress Report, 1982
D. A Gurnett, S. D. Shawhan, and R. R. Shaw May 1982 57 p refs Submitted for publication
(Contract NAS5-25690; Grants NGL-16-001-002; NGL-16-001-043; Contract N00014-76-C-0016)
(NASA-CR-169226; NAS 1.26:169226; AD-A115916; U-OF-IOWA-82-7) Avail: NTIS HC A04/MF A01 CSCL 04/1

The polar orbiting DE-1 spacecraft is now providing the first measurements of high latitude auroral phenomena in the altitude range between about 1 to 4 RE, where several important types of auroral plasma wave emissions are believed to be generated. This paper describes the initial observations from the DE-1 plasma wave instrument in this interesting region. Three principal types of plasma wave emissions are discussed: auroral hiss, Z-mode radiation, and auroral kilometric radiation. Whistler-mode auroral hiss emissions are observed on essentially every pass over the auroral zone. The auroral hiss usually has a characteristic 'funnel-shaped' frequency-time spectrum which can be explained by simple whistler-mode propagation effect if the radiation is emitted from a spatially localized source below the spacecraft. Ray path studies show that the auroral hiss is propagating upward from a source located at an altitude of about .07 to 0.9 RE. The DE-1 observations have for the first time clearly identified broadband Z-mode emissions in the low density region over the auroral zone and polar cap. This radiation usually has a sharply defined upper cutoff near the electron gyrofrequency and extends downward in frequency to a cutoff called the fL=O cutoff. The Z-mode radiation is sometimes difficult to distinguish from the auroral hiss, which occurs in the same general frequency range with about the same intensity. GRA

N82-32928# Lowell Univ., Mass. Center for Atmospheric Research.
AUTOMATIC PROCESSING OF DIGITAL IONOGRAMS AND FULL WAVE SOLUTIONS FOR THE PROFILE INVERSION PROBLEM Final Report, 7 Jul. 1980 - 7 Aug. 1981
B. W. Reinisch, H. E. Moses, and J. S. Tang Nov. 1981 63 p refs
(Contract F19628-80-C-0113; AF Proj. 4643)
(AD-A115820; ULRF-417/CAR; AFGL-TR-82-0014) Avail: NTIS HC A04/MF A01 CSCL 04/1

Methods for the automatic scaling of Digisonde ionograms are described. Making use of the available ionogram information, i.e., signal amplitude, polarization and incidence angle, the bottomside ionogram scaling algorithm extracts the ordinary echo trace with good accuracy even under very disturbed ionospheric conditions. The automated parameters for some 600 ionograms from Goose Bay, Labrador, were compared with the manually scaled values. For 82% of all ionograms foF2 was scaled within 0.5 MHz, and for 93% within 1 MHz in spite of the frequent occurrence of heavy spread F. New full wave methods for the profile inversion are explored in the second part of this report. Special profiles are investigated for which the full-wave equations can be solved exactly. Author (GRA)

N82-32929# Cambridge Univ. (England). Dept. of Engineering.
VERIFICATION OF THE NEWMARK ANALYSIS OF PERMANENT DISPLACEMENTS OF EARTH EMBANKMENTS SUBJECT TO EARTHQUAKE LOADS ON A GEOTECHNICAL CENTRIFUGE Final Technical Report, Jul. 1979 - Oct. 1981
Bruce L. Kutter Nov. 1981 57 p refs
(Contract DAJA37-79-C-0387; DA Proj. 1T1-61102-BH-57)
(AD-A115885) Avail: NTIS HC A04/MF A01 CSCL 13/13

The objective was verification of the Newmark (1965) sliding block analysis to predict permanent displacements of earth dams subjected to earthquake loading. The tests were conducted on a new Bumpy Road; shaking table aboard the Cambridge University Geotechnical Centrifuge. Clay embankment models of a triangular cross section with 1:2 slopes that represent prototypes of 6.9 m height were each submitted to between three and six earthquakes. The sliding block calculations consistently under estimated displacements; however, relative errors in displacements were smaller for large than small earthquakes. The yield of clay at stresses below the shear strength, dynamic magnification of base acceleration and strain softening during shaking are cited as factors contributing to unconservative predictions of displacements. Another, unexpected mode of embankment failure was observed: strain softening and pore pressure generation during one test caused a slope failure 3.5 s (two hours in prototype terms) after the model earthquake. The displacement during this slump was about 2.8 m in prototype terms, on the order of ten times the displacements which occurred during any actual earthquake. Author (GRA)

N82-32930# Research Inst. of National Defence, Stockholm (Sweden).
COMMON DATA BASE EXPERIMENT: REVISED EVENT BULLETIN
Harriet Ohlsson Feb. 1982 30 p refs In ENGLISH; SWEDISH summary
(FOA-C-20443-T1) Avail: NTIS HC A03/MF A01

A seismic event list, based on bulletins from 59 stations in 21 countries, supplemented by waveform data (58 stations, 13 countries) is presented. Magnitude, depth, and, for 43 events, the complexity parameter and third moment of frequency, are given. Author (ESA)

N82-32931# Research Inst. of National Defence, Stockholm (Sweden).
COMMON DATA BASE EXPERIMENT: DEPTH ESTIMATION USING MULTISTATION DATA
Falguni Roy Apr. 1982 70 p refs
(FOA-C-20454-T1) Avail: NTIS HC A04/MF A01

A procedure which estimates the depth phases of seismic events by analyzing multistation waveform data, including deconvolution, prediction error filtering, and spectral analysis, is presented. In the absence of depth phases, methods based on S-P, ScS-P, and SKS-P wave travel times are tried. The procedure was applied to waveform data collected from 31 globally distributed stations. Depths significantly different from those obtained from first arrival times are given for 120 out of 162 events in the magnitude range 3.5 to 6.2, defined from analysis of bulletins from 59 stations (level 1 data). Procedure applicability is 100% for events with magnitude $>$ 4.8, and 88% for magnitude $>$ 4. Uncertainty of depths is 10%. Comparison of level 1 and level 2 (waveform) data indicates that at least 1 station within 10 deg of the event is required in order to obtain good depth estimates from level 1 data alone. Author (ESA)

N82-32932# Fraunhofer Inst., Freiburg (West Germany).
EXPERIMENT FOR MEASUREMENT OF THE DC ELECTRIC FIELD BY DOUBLE PROBES AS PART OF THE ROCKET PAYLOADS SUBSTORM PHENOMENA Final Report, Feb. 1981
Reinhard Grabowski and Helmut Wolf Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 93 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-81-043; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19,30

The effects of magnetospheric substorms in the ionospheric height range were studied by in situ measurements with rockets. Several in situ measurements of the dc electric field were performed during substorms. The measuring method applied used electrical

double probes. Profiles of the electric field were obtained, covering the auroral oval and a height range up to 500 km. The profiles represent essential information for the interpretation of the substorm phenomenon and especially for the associated complex of auroral effects. Author (ESA)

N82-32933# Fraunhofer Inst., Freiburg (West Germany).
SOUNDING ROCKET PROGRAM AERONOMY. POLAR UPPER ATMOSPHERE PROJECT: RETARDING POTENTIAL ANALYZER Final Report, Jan. 1981
Alfred Dumbs Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 168 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-81-045; ISSN-0170-1339) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 33,30

A combination retarding potential and electrostatic analyzer to measure thermal and suprathermal electrons up to energies of 50 eV was developed. The experiment was flown onboard four rockets. The principle of the experiment and theoretical background are explained and geophysical result are shown. Author (ESA)

N82-32934# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abteilung Hochfrequenz-Physik.
MODELS OF THE IONOSPHERIC ELECTRON DENSITY DISTRIBUTION FOR THE CORRECTION OF PROPAGATION ERROR OF ELECTROMAGNETIC WAVES
Volker Stein Nov. 1981 87 p refs In GERMAN; ENGLISH summary
(DFVLR-Mitt-82-03) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 28,50

Tropospheric and ionospheric propagation errors of electromagnetic waves in the frequency range above 100 MHz are described in relation to geophysical parameters. Models for the correction of these errors are presented. Navigation and positioning system applications are considered. Author (ESA)

N82-32935# Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
A GEOPHYSICAL MODEL OF STRONG MOTION FOR A LARGE ENSEMBLE GENERATION
Jean B. Savy Jul. 1981 135 p refs
(Grant NSF PFR-78-27068)
(PB82-172628; NSF/CEE-81085; R81-6) Avail: NTIS HC A07/MF A01 CSCL 08K

A model of fault rupture is developed for use in qualitative studies of seismic hazard analyses. The total rupture area is modeled by an assemblage of rectangular patches with random size and aspect ratio. The propagation of the rupture front is simulated by a random process similar to a directed random walk process. The solution for the motion generated by a single patch is obtained by using the Haskell method of dislocation extended to a dislocation both in the length and width of the patch. To obtain a better approximation of the motion in the near to intermediate field, second order terms are added to the solution. Some examples dramatize the effects of fault orientation, focus location, stress drop, and overall geometry on the final peak acceleration and RMS acceleration at the observation point. A sensitivity analysis, and an enumeration of ongoing research and studies using the model are presented. GRA

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N82-32936*# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.
IMPROVED GLOBAL PREDICTION OF 300 NAUTICAL MILE MEAN FREE AIR ANOMALIES
Jaime Y. Cruz May 1982 105 p refs
(Grant NGR-36-008-161)
(NASA-CR-169308; NAS 1.26:169308; Rept-331) Avail: NTIS HC A06/MF A01 CSCL 04B

Current procedures used for the global prediction of 300nm mean anomalies starting from known values of 1 deg by 1 deg mean anomalies yield unreasonable prediction results when applied to 300nm blocks which have a rapidly varying gravity anomaly field and which contain relatively few observed 60nm blocks. Improvement of overall 300nm anomaly prediction is first achieved by using area-weighted as opposed to unweighted averaging of the 25 generated 60nm mean anomalies inside the 300nm block. Then, improvement of prediction over rough 300nm blocks is realized through the use of fully known 1 deg by 1 deg mean elevations, taking advantage of the correlation that locally exists between 60nm mean anomalies and 60nm mean elevations inside the 300nm block. An improved prediction model which adapts itself to the roughness of the local anomaly field is found to be the model of Least Squares Collocation with systematic parameters, the systematic parameter being the slope b which is a type of Bouguer slope expressing the correlation that locally exists between 60nm mean anomalies and 60nm mean elevations. Author

N82-32937*# New York Univ., New York.
METHODS OF SEQUENTIAL ESTIMATION FOR DETERMINING INITIAL DATA IN NUMERICAL WEATHER PREDICTION Ph.D. Thesis
Stephen E. Cohn Jun. 1982 190 p refs
(Grants NsG-5034; NsG-5130; Contract DE-AC02-76ER-03077)
(NASA-CR-170435; NAS 1.26:170435) Avail: NTIS HC A09/MF A01 CSCL 04B

Numerical weather prediction (NWP) is an initial-value problem for a system of nonlinear differential equations, in which initial values are known incomletely and inaccurately. Observational data available at the initial time must therefore be supplemented by data available prior to the initial time, a problem known as meteorological data assimilation. A further complication in NWP is that solutions of the governing equations evolve on two different time scales, a fast one and a slow one, whereas fast scale motions in the atmosphere are not reliably observed. This leads to the so called initialization problem: initial values must be constrained to result in a slowly evolving forecast. The theory of estimation of stochastic dynamic systems provides a natural approach to such problems. For linear stochastic dynamic models, the Kalman-Bucy (KB) sequential filter is the optimal data assimilation method, for linear models, the optimal combined data assimilation-initialization method is a modified version of the KB filter. S.L.

N82-32938*# Engineering and Economics Research, Inc., Falls Church, Va.
UNBIASED ESTIMATION OF OCEANIC MEAN RAINFALL FROM SATELLITE BORNE RADIOMETER MEASUREMENTS
Mahesh C. Mittal Apr. 1981 63 p refs
(Contract NAS5-26145)
(NASA-CR-170429; NAS 1.26:170429; TR-02-81) Avail: NTIS HC A04/MF A01 CSCL 04B

The statistical properties of the radar derived rainfall obtained during the GARP Atlantic Tropical Experiment (GATE) are used to derive quantitative estimates of the spatial and temporal sampling errors associated with estimating rainfall from brightness temperature measurements such as would be obtained from a satelliteborne microwave radiometer employing a practical size antenna aperture. A basis for a method of correcting the so called beam filling problem, i.e., for the effect of nonuniformity of rainfall over the radiometer beamwidth is provided. The method presented employs the statistical properties of the observations themselves without need for physical assumptions beyond those associated with the radiative transfer model. The simulation results presented offer a validation of the estimated accuracy that can be achieved and the graphs included permit evaluation of the effect of the antenna resolution on both the temporal and spatial sampling errors. N.W.

N82-32939*# Hawaii Univ., Honolulu. Dept. of Meteorology.
EVALUATION AND COMPARISON OF TROPICAL ANALYSES DURING DST-5 AND DST-6 Final Report
James C. Sadler [1980] 31 p refs
(Contract NAS5-25376)
(NASA-CR-170431; NAS 1.26:170431; UHMET-80-05) Avail: NTIS HC A03/MF A01 CSCL 04B

Data systems tests were conducted to assess the adequacy of the global data base for numerical analysis and forecasting and in the process to determine the impact of meteorological satellite data. The results of these tests indicate that the satellite data impact is model and season dependent but definitely dependent on the method of data assimilation and the numerical model used to produce the analyses or initial conditions. S.L.

N82-32940# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A STUDY OF METEOROLOGICAL TIME SERIES. PART 1: MODELING PERSISTENCE
Srinivasan Srivatsangam and Vernon Edgar Kousky Oct. 1981 63 p refs Submitted for publication
(INPE-2253-PRE/036-Pt-1) Avail: NTIS HC A04/MF A01

The role of persistence in time series can be modeled by autoregressive (or Markov) processes, provided that the series are stationary. In general, meteorological variables have a pronounced seasonal cycle, which makes the mean a function of time. Hence, the seasonal cycle must be removed before stochastic modeling, or spectrum analysis, is done. Retention of the seasonal cycle leads to the false conclusion that a first order autoregressive model best represents meteorological time series. If the seasonal cycle is removed before modeling, the best fits are usually given by higher order autoregressive processes. These higher order processes quite often have free solutions which are oscillatory and, therefore, are more relevant to the dynamics of the weather. Author

N82-32941# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A STUDY OF METEOROLOGICAL TIME SERIES. PART 2: NONSTATIONARITY
Vernon E. Kousky and S. Srivatsangam Nov. 1981 32 p refs Submitted for publication
(INPE-2259-PRE/041-Pt-2) Avail: NTIS HC A03/MF A01

Lack of stationarity is induced in meteorological time series in many ways. The obliquity of the ecliptic is presumably the prime cause of the seasonal cycle in the mean. This seasonal cycle is, however, not uniformly repetitive. The interannual variability of the seasonal cycle is investigated, as an estimation problem. In addition to the seasonal cycle in the mean, there are oscillations of long period, for which no unique cause can be specified. In short time series, these long period oscillations also cause the mean to be a function of time, and thus produce nonstationarity. If spectral analysis or stochastic modeling is to be performed, it is necessary to subtract these trend like features as well as the seasonal cycle. Stationarizing the statistical expectation, however, does not even yield wide sense stationarity. Many meteorological variables display, depending on location, a nonstationarity in the variance; they may also have nonstationarity of covariance. Either one of these characteristics immediately turns the spectrum into a function of time, in addition to its naturally being a function of frequency. It is shown that the zero lag cross covariances of atmospheric variables are also nonstationary. Thus, for instance, the meridional transports of sensible heat and zonal momentum, due to the high frequency weather components, are functions of the calendar day. Hence the cross spectra due to the weather must be calculated with extreme care. Author

N82-32942# Weather Squadron (30th), San Francisco, Calif. 96307.
TERMINAL FORECAST REFERENCE NOTEBOOK, DETACHMENT 8, FIRST WEATHER WING, KADENA AB, OKINAWA (JAPAN)
21 Jul. 1981 41 p
(AD-A115661; AD-E850161; Rept-30WD-TFRN-81/002) Avail: NTIS HC A03/MF A01 CSCL 04/2

This publication provides weather forecasting guidelines for Kadena AB, Okinawa (Japan). The types of information contained are: climatology, topography, typhoon worksheets, data availability, location of meteorological instruments, and weather impact on supported units. GRA

N82-32943# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Physical Sciences Branch.
SENSIBLE AND LATENT HEAT FLUXES AND HUMIDITY PROFILES FOLLOWING A STEP CHANGE IN SURFACE MOISTURE
Edgar L. Andreas Apr. 1982 28 p refs
(DA Proj. 4A1-61102-AT-24)
(AD-A115596; CRREL-82-12) Avail: NTIS HC A03/MF A01 CSCL 04/2

From a high-quality set of velocity, temperature, and humidity profiles collected upwind and downwind of a step change in surface roughness, temperature, and moisture, we have calculated upwind and downwind values of the heat fluxes and friction velocity. The surface change is from smooth to rough; upwind, the sensible heat flux is upward and the latent heat flux is zero; downwind, the surface is well-watered so that the latent heat flux is upward while the sensible heat flux is downward. The downwind latent heat flux in this fetch-limited flow obeys $NL = 0.08\ Rx^{0.76}$ where NL is the latent heat Nusselt number and Rx is the fetch Reynolds number, a parameter for characterizing fetch-limited flows. Because this relation is virtually the same as one found to describe the sensible heat and condensate fluxes over arctic leads, we conclude that the Nusselt numbers nondimensionalizing scalar fluxes are the same for a given fetch Reynolds number when boundary conditions are similar. GRA

N82-32944# New Mexico State Univ., Las Cruces. Physical Science Lab.
A LEAST SQUARES APPROACH TO MISSING METEOROLOGICAL DATA Final Report
Jack D. Drummond and Francis A. Lawrence White Sands Missile Range, N. Mex. Army Electronics Research and Development Command Apr. 1982 47 p refs
(Contract DAAD07-79-C-0008; DA Proj. 1L1-61102-AH-71)
(AD-A115999; ASL-CR-82-0008-1) Avail: NTIS HC A03/MF A01 CSCL 04/2

In battlefield situations it is not uncommon to lose all or a portion of the meteorological data needed for artillery ballistic purposes due to malfunction of equipment or the balloon bursting prematurely. This report describes several techniques to provide for these missing data. Further, a preliminary comparison of these techniques is made. Author (GRA)

N82-32945# Systems and Applied Sciences Corp., Monterey, Calif.
SHIPBOARD TROPICAL CYCLONE APPLICATIONS SOFTWARE SYSTEM FOR THE WESTERN NORTH PACIFIC OCEAN Final Report
Don Chin Monterey, Calif. Naval Environmental Prediction Research Facility Apr. 1982 42 p refs
(Contract N00228-81-C-H157; WO512CC)
(AD-A115791; NEPRF-CR-82-07) Avail: NTIS HC A03/MF A01 CSCL 04/2

The shipboard Tropical Cyclone Applications Software System (TCASS) is described. TCASS is a set of microcomputer programs which displays and evaluates the tropical cyclone wind threat to a ship or unit. Tropical cyclone wind probability forecast methods for the western North Pacific Ocean, based on statistical analyses of historical tropical cyclone forecast errors, are used within TCASS. If the tropical cyclone wind threat exceeds a predefined threshold level, an alternative routing procedure is invoked to reduce the threat level. Applications of the software are provided, and examples of the resulting output are included. Author (GRA)

N82-32946# Ben Gurion Univ. of the Negev, Sede Boqer (Israel). Inst. for Desert Research.

THE BEHAVIOR OF THE ATMOSPHERE IN THE DESERT PLANETARY BOUNDARY LAYER Final Scientific Report, 1 May 1981 - 30 Apr. 1982

Louis Berkofsky 30 Apr. 1982 30 p refs Sponsored in part by European Office of Aerospace and Development

(Contract AF-AFOSR-0126-81; AF Proj. 2310)

(AD-A115923; AFOSR-82-0497TR) Avail: NTIS HC A03/MF A01 CSCL 04/2

The processes taking place in the atmospheric desert planetary boundary layer determine the evolution of those circulations which control not only its subsequent behavior, but that of the atmospheric layers above it. The structure of the boundary layer at any given time determines the subsequent low level stratification, and hence the occurrence of such phenomena as radar ducting, dust/sand storms, low level jets. The general objective of the proposed research is to develop, refine, and integrate a numerical model of the planetary boundary layer which will have the capability of predicting its future behavior. The model will be tested with reference to an observational mesonet which will be established in the Negev desert. A feature of the model will be the ability to assess the effect on a mass of warm dry air from the land passing over a body of water. Another related feature of the model will be its ability to predict the variation in desert inversion height - a parameter of utmost importance in controlling desert circulation. The same model will also be applicable in prediction of the behavior of the marine inversion. By including a dust concentration equation the capability of the model will be increased to predict this very important desert parameter. GRA

N82-32947# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.

A SURVEY OF MICROMETEOROLOGICAL PARAMETERS WITHIN A FOREST CANOPY AT FORT POLK, LOUSIANA Final Report

Ronald M. Cionco, Willy Z. Sadeh (Colorado State Univ., Ft. Collins), Francis W. Law (Colorado State Univ., Ft. Collins), William E. Marlatt (Colorado State Univ., Ft. Collins), and Douglas G. Fox (Colorado State Univ., Ft. Collins) Feb. 1982 182 p refs

(Contract DAAG29-76-D-0100)

(AD-A117148; ERADCOM/ASL-CR-82-0100-1) Avail: NTIS HC A09/MF A01 CSCL 04/2

A field investigation of micrometerological parameters inside and above a forest canopy at Fort Polk, Louisiana, was conducted in conjunction with the Atmospheric Sciences Laboratory Dusty Infrared Test IIIA. The three orthogonal components of the wind, dry and wet bulb temperatures and total solar radiation were measured inside this forest canopy by means of an instrumented meteorological tower. In addition, turbulence inside of the forest canopy was monitored by means of hot-wire anemometers. Tethersonde balloon sounding above the forest canopy was further performed. The meteorological data was reduced by means of three different statistical methods. Single sample period values, one-minute sample averages and sequential sample values were computed. The latter two methods led to the construction of time series which can readily be used to perform advanced statistical analyses. Totals of 27 h 29 min of meteorological tower data and 2 h 50 min of balloon data were reduced. The results are presented in tabular form in 1422 tables and partially displayed in 1795 figures under separate cover in view of their large volume. Selected samples of the results are, however, presented herein. The results supply a data base for analyses of airflow in a forest canopy. Suggestions for future work of significance for mission-oriented cases and for modeling of airflow in a forest canopy are outlined. Author (GRA)

N82-32948# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.

A CLIMATOLOGICAL STUDY OF THE AFGL MESONETWORK, VOLUME 2 Final Scientific Report

H. Albert Brown 11 Jan. 1982 284 p

(AF Proj. 6670)

(AD-A116962; AFGL-TR-82-0011-Vol-2; AFGL-ERP-764-Vol-2) Avail: NTIS HC A13/MF A01 CSCL 04/2

This volume is a five-part statistical summary of surface weather observations collected by 13 stations of the AFGL Mesonetwork during the period September 1972 through August 1973. Section 1 gives the monthly and annual cumulative percentage frequencies of extinction coefficient. Section 2 contains the diurnal cumulative percentage frequency of extinction coefficient for each month of the twelve-month period. Section 3 shows the annual and monthly percentage frequency distribution of wind speeds in 12 classes. Section 4 contains the diurnal percentage frequency distribution of wind speed for each month of the twelve-month period. Section 5 presents a monthly and annual bivariate percentage frequency distribution of wind direction and speed. Author (GRA)

N82-32949# Cologne Univ. (West Germany). Inst. fuer Geophysik and Meteorologie.

SODAR MEASUREMENTS OF INVERSIONS OVER THE RHINE VALLEY (COLOGNE AND SURROUNDINGS) [SODAR-MESSUNGEN VON INVERSIONEN UEBER DEM RHEINTAL (KOELN UND UMGEBUNG)]

R. Dohrn, E. Raschke, A. Bujnoch, and G. Warmbier 1981 54 p refs In GERMAN; ENGLISH summary

(Mitt-32; ISSN-0069-5882) Avail: NTIS HC A04/MF A01

Inversion heights were measured continuously with two SODARS, one over a two year period, wherein one was located near the center of Cologne and the other about 12 km northwest of it (rural environment). Verification measurements were also made with a balloon-borne tethered sonde. A pattern recognition method was developed for automatic analysis of digitized SODAR records. Statistical analysis of the annual and diurnal variation of probability of inversion occurrence and height is presented. Significant differences occur for low level inversion structures over both stations while upper level inversions show large similarities. The inversion height depends to some degree on the surface geostrophic wind speed. Author (ESA)

N82-32950# Centre Technique des Industries Mecaniques, Senlis (France).

COMPARATIVE STUDY OF NORMS FOR BUILDINGS AND CRANES: THE AVERAGE WIND VELOCITY IN THE ATMOSPHERIC BOUNDARY LAYER [ETUDE COMPARTIF DE NORMES SUR LES BATIMENTS ET LES ENGINS DE LEVAGE: LA VITESSE MOYENNE DU VENT DANS LA COUCHE LIMITE ATMOSPHERIQUE]

J. C. Jouannet and M. Watremetz 14 Dec. 1981 21 p refs In FRENCH

(CETIM-N-5-K-071) Avail: NTIS HC A02/MF A01

European and American norms for structures 20 to 150 m high, in urban or rural areas were compared. It is shown that the European norms applied to cranes and other temporary service high structures do not define a wind velocity reference, and do not account for a vertical wind velocity gradient. Author (ESA)

N82-32951# National Oceanic and Atmospheric Administration, Rockville, Md. National Earth Satellite Service.

THE WEFAX USERS GUIDE

Richard M. Clark and Earl W. Feigel Nov. 1981 55 p

(PB82-168956; NOAA-81121705) Avail: NTIS HC A04/MF A01 CSCL 04B

The term WEFAX (Weather Facsimile) identifies both a communication subsystem and a service provided by, and through, the GOES (Geostationary Operational Environmental Satellite). WEFAX involves the retransmission of low resolution geostationary and polar orbiter satellite imagery, or other meteorological data, through the GOES spacecraft to relatively low-cost receiving units within receiving range of the spacecraft. General information about the spacecraft, the WEFAX ground system, and services provided are presented in this publication. Details on the real-time data links are included for those planning to install ground stations to receive WEFAX broadcasts. Author

N82-32952# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environment Lab.
OBSERVATIONS OF SOUTH ALASKAN COASTAL WINDS
R. M. Reynolds, S. A. Macklin, and T. R. Hiester (Battelle-Northwest Lab., Richland, Wash.) Jul. 1981 58 p refs
(PB82-164823; NOAA-TM-ERL-PMEL-31; NOAA-81121704) Avail: NTIS HC A04/MF A01 CSCL 04B

Two main groups of offsore katabatic flow, fall winds and gravity winds, are defined and discussed. Climatological averages of the Alaskan synoptic weather patterns that promote offshore flow on the south Alaskan coast. Observations were taken over several years ner the Malaspina Glacier on the south coast of Alaska using research ships, buoys, and on one occasion an instrumented aircraft. Upper-air soundings in this region reveal a complicated process whereby coastal air flows under the marine boundary layer and subequently is absorved into it by a process of entrainment and warning. Author (GRA)

N82-32953# National Oceanic and Atmospheric Administration, Boulder, Colo. Weather Modification Program Office.
MECHANISM OF SHALLOW WINTER-TYPE STRATIFORM CLOUD SYSTEMS
H. Weickmann (Cooperative Inst. for Research in Environmental Science, Boulder, Colo.) Oct. 1981 68 p refs
(PB82-170176; NOAA-81121702) Avail: NTIS HC A04/MF A01 CSCL 04B

In twelve shallow, upslope cloud systems, along the eastern slopes of the Rocky Mountains in Colorado, two parameters were measured. The rate of precipitation, by use of a Dew Scale, and the number flux of snow crystals, by use of photographs. Life histories of upslope snowstorms were plotted to show rate of precipitation, crystal flux, and mean mass of the crystals. In five storms the rate of precipitation and paticle flux were proportional; in two more there was a less pronounced similarity of the curves. It is suggested that the observed proportionality is due to the rate of condensation, wich is governed by the velocity of the updraft, in a strong feedback mechanism between the microscale and the mesoscale; water vapor is released to form liquid water and ice crystals at nucleation threshold temperatures. Author (GRA)

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N82-32954 Defence Research Information Centre, Orpington (England).
DETERMINATION OF ORGANIC ADMIXTURES IN SEAWATER BY LASER FLUORIMETRY
A. G. Abroskin, G. M. Georgien, A. A. Deyatov, T. V. Laphenskova, Z. S. Nikolov, K. V. Stamenov, V. V. Fadeev, A. M. Chekalyuk, and V. V. Chubarov Jun. 1982 12 p refs Transl. into ENGLISH from Bulg. J. Phys. (USSR), v. 8, no. 3, 1981 pp 267-273
(DRIC-T-6665; BR83685) Copyright. Avail: Issuing Activity

Natural and artificial organic admixture quantity in Black Sea water was studied by remote laser sensing from on board ship under stationary and moving conditions, as well as by laser fluorimetry of sea water samples. Raman scattering signals of water and petroleum extractant were used for calibration. The data were used to study phytoplankton distribution and distribution of dissolved organic matter (yellow substance) in deep water and in the surface layer. The concentration of dissolved petroleum products in Burgas bay is found to be less than 1 microgram/l. Author (ESA)

N82-32955# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A SYNOPTIC APPROACH TO STUDING CHANGES IN SEA SURFACE TEMPERATURE USING GEOSTATIONARY SATELLITE DATA
Merritt R. Stevenson May 1982 14 p refs Presented at the 16th Intern. Symp. on Remote Sensing of Environ., Buenos Aires, 2-9 Jun. 1982
(INPE-2398-PRE/114) Avail: NTIS HC A02/MF A01

Data from radiometers aboard meteorological satellites provide a unique method to study surface thermal features of the ocean on a large scale, synoptic basis. The utility of such a data base, however, depends upon both thermal and spatial resolution of the sensors. Because the geostationary SMS and GOES satellites provide essentially the same geometric perspective each time the earth is scanned, this type of orbital platform was selected. Three computer programs are used in sequence to process and convert the data into a machine contoured map of surface temperature. Each chart covers a 15 deg x 15 deg area and uses a map scale of 8 million to 1. The contour interval is set at 2 C. When software becomes operational, the contoured maps of temperature will be of considerable use for diverse regional studies such as marine climatology and marine resource development. Author

N82-32956# Coastal Engineering Research Center, Fort Belvoir, Va. Coastal Oceanography Branch.
ENERGY LOSSES OF WAVES IN SHALLOW WATER
William G. Grosskopf and C. Linwood Vincent Feb. 1982 19 p refs
(AD-A116274; CERC-CETA-82-2) Avail: NTIS HC A02/MF A01 CSCL 08/3

This report presents a method for predicting nearshore significant wave height given the straight-line fetch length, the windspeed, and the nearshore water depth. The prediction curves were generated by numerically propagating offshore Joint North Sea Wave Project(JONSWAP) spectra shoreward while applying shoaling and wave steepness limitation criteria to each spectral component. Example problems are included. GRA

N82-32957# Washington Univ., Seattle. Applied Physics Lab.
DESIGN, OPERATION AND PERFORMANCE OF AN EXPENDABLE TEMPERATURE AND VELOCITY PROFILES (XTVP) Final Report
Thomas B. Sanford, Robert G. Drever, John H. Dunlap, and Eric A. DAsaro May 1982 174 p refs
(Contract N00014-80-C-0347)
(AD-A115659; APL-UW-8110) Avail: NTIS HC A08/MF A01 CSCL 08/3

This report presents system design and implementation information for the Expendable Temperature and Velocity Profiler (XTVP). The topics include discussions of the probe, acquisition equipment, analysis software, probe calibration, launch procedures, and error analysis. GRA

N82-32958# National Academy of Sciences - National Research Council, Washington, D. C. Ad Hoc Committee on Computing Resources and Facilities for Ocean Circulation Modelling.
AN ASSESSMENT OF COMPUTATIONAL RESOURCES REQUIRED FOR OCEAN CIRCULATION MODELLING
Jun. 1982 73 p refs
(Grant N00014-80-G-0050)
(AD-A116024) Avail: NTIS HC A04/MF A01 CSCL 08/3

This report documents the probability of a significant shortage by 1984 in the availability of computer resources for ocean circulation modelling. Computers are the modern tool with which scientists calculate answers to problems in all fields of inquiry. In the natural sciences it is straightforward to pose extensive and complicated calculations that must be done on large-scale computers. Such disciplines as physics, chemistry and meteorology have effectively used each new generation of fast computers to improve understanding of nature, generate hypotheses and make laboratory data meaningful. In particular, meteorologists have gained new understanding of atmospheric dynamics and applied their knowledge to improve weather forecasts. Oceanographers are now proposing to expand their use of high speed computers to increase their physical understanding of the ocean and to apply it to problems, in climate, fishery management, long-range weather prediction and management of ocean resources. Author (GRA)

N82-32959# Howard Univ., Washington, D. C. Dept. of Chemistry.
RAMAN AND X-RAY INVESTIGATIONS OF ICE 7 TO 36.0 GPa
G. E. Walrafen, M. Abebe, F. A. Mauer, S. Block, and G. J. Piermarini 30 Jun. 1982 34 p refs
(Contract N00014-80-C-0305)
(AD-A116900; TR-10) Avail: NTIS HC A03/MF A01 CSCL 07/4

Raman data for ice VII to 30 GPa and X-ray lattice parameters to 36 GPa, all at room temperature, are presented and discussed. Both the Raman OH-stretching peak frequency (delta cap Nu) and the edge distance of the body-centered cubic unit cell (a) decrease at a decreasing rate with pressure rate. The OH peak frequency is found to be virtually linear in the nearest-neighbor 0-0 distance (r00) between about 2.5 and 2.9 A. However, the data can also be fitted with a slight cubic dependence, which when extrapolated, gives rise to a minimum in delta cap Nu at r00 = 2.35 plus or minus 0.06 A. This is close to the value of 2.4 A found for the symmetric O-H-O units in other materials.
Author (GRA)

N82-32960# Skidaway Inst. of Oceanography, Savannah, Ga.
OCEANOGRAPHY OF THE SOUTH ATLANTIC BIGHT
Jul. 1981 19 p
(Contract DE-AS09-76EV-00901)
(DE82-010539; DOE/EV-00901) Avail: NTIS HC A02/MF A01

Current knowledge of the natural processes of circulation, biology and material transport in the South Atlantic Bight are described. The environmental needs of increasing energy demands led to redirection of marine research from deeper ocean studies to coastal waters. The marine research is organized into four major coastal regions. The regional programs give a better definition of different marine coastal system functions and morphologies natural marine phenomena and the impacts of human activities are identified. The way toward maintaining the delicate marine ecological balance, while continuing to satisfy national energy requirements is pointed out. E.A.K.

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N82-32961*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
STS-3 MEDICAL REPORT
Sam L. Pool, ed., Philip C. Johnson, Jr., ed., and John A. Mason, ed. Aug. 1982 37 p refs
(NASA-TM-58247; S-517; NAS 1.15:58247) Avail: NTIS HC A03/MF A01 CSCL 06C

The medical operations report for STS-3, which includes a review of the health of the crew before, during, and immediately after the third Shuttle orbital flight is presented. Areas reviewed include: health evaluation, medical debriefing of crewmembers, health stabilization program, medical training, medical 'kit' carried in flight, tests and countermeasures for space motion sickness, cardiovascular profile, biochemistry and endocrinology results, hematology and immunology analyses, medical microbiology, food and nutrition, potable water, shuttle toxicology, radiological health, and cabin acoustic noise. Environmental effects of shuttle launch and landing medical information management, and management, planning, and implementation of the medical program are also dicussed. S.L.

N82-32962# Wisconsin Univ., Madison. Dept. of Chemical Engineering.
PROPERTIES OF MULTIPHASE POLYURETHANE SYSTEMS Final Report, 1 Jul. 1981 - 30 Jun. 1982
Stuart L. Cooper Aug. 1982 37 p Sponsored by Navy
Avail: NTIS HC A03/MF A01

The synthesis and characterization of polyurethane anionomers was studied. The method used to prepare polyurethane anionomers was to sulfonate the urethane nitrogen via a bimolecular nucleophilic displacement. Polyurethane anionomers were prepared from conventional polyether polyurethanes ET-20 and ET-38. ET-20 is an MDI/PTMO (1000) copolymer exhibiting a single phase morphology containing 20 wt% MDI. ET-38 (38 wt% MDI) is an MDI/BD/PTMO polyurethane of molar ratios 3/2/1 demonstrating a well phase separated morphology. Each of these polymers were sulfonated to several different levels. The coordination of sodium sulfonate with the polymer hard segments or soft segments was investigated and the alteration of physical properties which occur upon anionization was explained. The experimental techniques employed include gel permeation chromatograhy, infrared spectroscopy, differential scanning calorimetry, dynamic mechanical testing, and stress-strain analysis. S.L.

N82-32963*# Temple Univ., Philadelphia, Pa.
THE INFLUENCE OF VARIED GRAVITO-INERTIAL FIELDS ON THE CARDIAC RESPONSE OF ORB-WEAVING SPIDERS Annual Report
Alfred Finck Aug. 1982 59 p refs
(Grant NAGw-242)
(NASA-CR-169314; NAS 1.26:169314) Avail: NTIS HC A04/MF A01 CSCL 06C

The Gz transfer function was described for the orb weaving spider A. sericatus. The functional relationship between the heartrate and the intensity of G is linear in the form of: Y = a Log Gz-1 +k. The heartrate in unrestrained animals was recorded by a laser plethysmograph developed specifically for this purpose. Following a control, sample heartrate were taken postrotation between 1.001 and 1.5 Gz in 6 steps. The underlying distribution of heartrates does not appear significantly different from a Gaussian distribution. A method of varnishing the legs of the spider was developed. This was done in order to compromise the lyriform organs, especially those located on the patellae. The lyriform organ is hypothesized to serve the receptor role in the transduction of gravity related stimuli. In preliminary animals the Gz function, post varnishing of the patellae, appers to be changed in the direction of poorer discrimination. We also observed that the resting heartrate following the varnish procedure is substantially increased. S.L.

N82-32964# Letterman Army Inst. of Research, San Francisco, Calif. Electron Microscopy Group.
CORNEAL ENDOTHELIUM AFTER INFRARED LASER EXPOSURE. EVALUATION OF TECHNIQUES TO STUDY CORNEAL LESIONS Final Report, 1975 - 1982
S. Schuschereba, B. Stuck, and P. Shawaluk Jun. 1982 19 p refs
(AD-A116748; LAIR-123) Avail: NTIS HC A02/MF A01 CSCL 06/3

Specimens of corneal endothelium of adult rhesus monkeys were evaluated for alterations by one of three staining techniques. One cornea from each animal was exposed to carbon dioxide laser radiation and removed surgically 2 hours after exposure. The other eye of each of the 18 monkeys served as controls. Each control cornea was stained with the same as the matching specimen. All specimens were processed for histologic examination by embedding in Epon. The combined use of TB and TNBT staining procedures allows detection of subtle alterations of the corneal endothelium at irradiances as low as 25 watts/sq cm of CO2 laser (10.6 micrometers) radiation for a 100 msec exposure. Enzyme activity is induced at irradiances from 35 to 65 watts/sq cm, which causes progressive increase in the incidence of altered cellular viability. The application of the combined techniques allows a better description of the response of the corneal endothelium to infrared laser radiation and its dose dependence. GRA

N82-32965# Armed Forces Radiobiology Research Inst., Bethesda, Md. Behavioral Sciences Dept.
BEHAVIORAL STUDIES FOLLOWING IONIZING RADIATION EXPOSURES: A DATA BASE
C. G. Franz, R. W. Young, and W. E. Mitchell Aug. 1981 94 p refs
(AD-A115825; AFRRI-TR-81-4) Avail: NTIS HC A05/MF A01

CSCL 09/2

Data concerning the effects of ionizing radiation on primate performance are the basis for current radiation combat casualty criteria. The data were consolidated into a computerized data base. Potential users are provided with the background and details necessary to access the data base and to retrieve information from it. The search parameters for the data base are defined, and the sources, extent, and reliability of data contained in the data set are discussed. Author

N82-32966# Oak Ridge National Lab., Tenn. Health and Safety Research Div.

INVESTIGATION OF CORRELATIONS BETWEEN CHEMICAL PARAMETERS OF METAL IONS AND ACUTE TOXICITY IN MICE AND DROSOPHILA

J. E. Turner, E. H. Lee, K. Bruce Jacobson, Nelwyn T. Christie (Tennessee Univ., Oak Ridge), M. W. Williams, and James D. Hoeschele 1981 21 p refs Presented at the 21st Hanford Life Sci. Symp. on Biol. Availability of Trace Metals, Richland, Va., 4 Oct. 1981

(Contract W-7405-eng-26)

(DE82-001451; CONF-811035-2) Avail: NTIS HC A02/MF A01

The correlations between physicochemical properties associated with metal ions and their observed toxicity was studied. One approach employs chemical concepts of hard and soft acids and bases. A set of LD50 values for acute toxicity in mice for 24 metal ions was obtained under uniform conditions. With these new data, a better correlation between LD50 and Pearson's softness parameter delta/sub p/, is obtained. It is suggested that better correlations might exist for parameters more relevant to biological systems. From a wide range of parameters, not necessarily limited to ions of a given charge as is delta/sub p/, it was found that the electrode potential gives as good a correlation as delta/sub p/. DOE

N82-32967# Oak Ridge National Lab., Tenn. Health and Safety Research Div.

ENHANCED BENZO[A]PYRENE METABOLISM IN HAMSTER EMBRYONIC CELLS EXPOSED IN CULTURE TO FOSSIL-SYNFUEL PRODUCTS

D. D. Schuresko, G. D. Griffin, M. C. MacLeod, and J. K. Selkirk 1981 7 p refs Presented at the 6th Symp. on Polycyclic Aromatic Hydrocarbons, Columbus, Ohio, 27 Oct. 1981

(Contract W-7405-eng-26)

(DE82-002904; CONF-811086-3) Avail: NTIS HC A02/MF A01

The enzyme aryl hydrocarbon mono-oxygenase (AHM) is involved in the initial metabolism of polynuclear aromatic (PNA) compounds to excretable polar derivatives. The utilization of AHM induction as a biochemical indicator of exposure to PNA's is investigated in cultured mammalian cells exposed to fossil synfuel materials. DOE

N82-32968# Washington State Univ., Pullman. Dept. of Agronomy and Soils.

LACK OF INDUCTION OF SINGLE-STRAND BREAKS IN MAMMALIAN CELLS BY SODIUM AZIDE AND ITS PROXIMAL MUTAGEN

P. Arenaz (Temple Univ., Philadelphia), R. A. Nilan, and A. Kleinhofs 1981 19 p refs

(Contracts DE-AT06-76EV-72002; DE-AM06-76RL-02221)

(DE82-001721; DOE/EV-72002/56; DOE/RL-02221/56) Avail: NTIS HC A02/MF A01

The effect of azide and its proximal mutagen (mutagenic metabolite) on single strand breaks was investigated and the potential hazard of azide exposure to man was evaluated. Chinese hamster V79 cells were treated with either azide or its proximal mutagen(s) for 2 h or 6 h respectively and analyzed by alkaline elution for single strand breaks. It is shown that there is no effect of either azide or the proximal mutagen(s) on single strand DNA breaks nor is there any indication that azide or the proximal mutagen(s) induced DNA protein crosslinks. It is suggested that neither azide nor its proximal mutagen(s) interact directly with DNA and that the methods may be applied to any specified population and dose scenario. DOE

N82-32969# Paris VII (France). Inst. de Recherche en Biologie Moleculaire.

[ACTIVITIES OF THE INSTITUTE FOR RESEARCH IN MOLECULAR BIOLOGY] Annual Report, 1980/81 [INSTITUT DE RECHERCHE EN BIOLOGIE MOLECULAIRE: RAPPORT D'ACTIVITE, ANNEES 1980-1981]

1981 315 p refs In FRENCH

Avail: NTIS HC A14/MF A01

Work in the fields of microbiology, molecular genetics, cellular and molecular differentiation, cellular genetics and immunology, and in developmental biochemistry is reported. Complemented and current projects are described and results are presented. Author (ESA)

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N82-32970 Defence Research Information Centre, Orpington (England).

TOXICOLOGICAL TESTS ON TRIFLUOROMONOBROMOMETHANE

J. Scholz and W. Weigand Jun. 1982 13 p refs Transl. into ENGLISH from Zentralblatt fuer Arbeitsmed. u. Arbeitsschutz (West Ger.), 1964 pp 129-131

(DRIC-T-6663; BR83701) Copyright. Avail: Issuing Activity

Freon 13 B 1 inhalation tests are summarized. After a single 2hr exposure, no behavioral changes in rats and guinea pigs, even at a concentration of 60% by volume, are reported. In long-term experiments, rats, guinea pigs, dogs and cats were exposed for a total of 70 hr to a 20% by volume (200,000 ppm concentration) of freon 13 B 1. During the experiment, the animals exhibited no behavioral changes. Histological examination indicates no pathological changes in the organs. Employees in production and filling plants, who worked for many years in a moderate freon atmosphere suffer no health damage as a result. Author (ESA)

N82-32971*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

DUAL PHYSIOLOGICAL RATE MEASUREMENT INSTRUMENT Patent Application

Tommy Cooper, inventor (to NASA) (Narco Scientific, Houston, Tex.) Filed 1 Jul. 1982 12 p Sponsored by NASA

(NASA-Case-MSC-20078-1; US-Patent-Appl-SN-394343) Avail: NTIS HC A02/MF A01 CSCL 06B

An instrument for converting a physiological pulse rate into a corresponding linear output voltage is described. The instrument, which accurately measures the rate of an unknown rectangular pulse wave over an extended range of values, comprises a phase-licked loop including a phone comparator, a filtering network, and a voltage-controlled oscillator, arranged in cascade. The phase comparator has a first input responsive to the pulse wave and a second input responsive to the output signal of the voltage-controlled oscillator. The comparator provides a signal dependent on the difference in phase and frequency between the signals appearing on the first and second imputs. A high-input impedance amplifier accepts an output from the filtering network and provides an amplified output DC signal to a utilization device for providing measurement of the rate of the pulse wave. NASA

N82-32972*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.

CLINICAL OPHTHALMIC ULTRASOUND IMPROVEMENTS Final Report

J. B. Garrison and P. A. Piro Aug. 1981 33 p refs

(Contracts NAS5-26085; N00024-81-C-5301)

(NASA-CR-170432; NAS 1.26:170432) Avail: NTIS HC A03/MF A01 CSCL 06E

The use of digital synthetic aperture techniques to obtain high resolution ultrasound images of eye and orbit was proposed. The parameters of the switched array configuration to reduce data collection time to a few milliseconds to avoid eye motion problems in the eye itself were established. An assessment of the effects of eye motion on the performance of the system was obtained. The principles of synthetic techniques are discussed. Likely applications are considered. Author

N82-32973# Bolt, Beranek, and Newman, Inc., Los Angeles, Calif. Office of Environment and Energy.
POSSIBILITY OF HEARING LOSS FROM EXPOSURE TO INTERIOR AIRCRAFT NOISE Final Report
Karl S. Pearsons and John F. Wilby Nov. 1981 80 p refs
(Contract DTFA01-80-C-1046)
(AD-A116504; FAA-AEE-81-15) Avail: NTIS HC A05/MF A01 CSCL 01/2

This report reviews criteria for hearing damage developed by the Committee on Hearing, Bioacoustics and Biomechanics (CHABA) of the National Academy of Science. It presents noise levels occurring in narrow and wide body commercial aircraft, business jet aircraft and short takeoff and landing (STOL) aircraft. It presents estimates of time exposure for pilots and crews based on FAA permitted flight times. It also provides estimations of possible hearing damage resulting from different exposures to interior noise of various aircraft types. Author (GRA)

N82-32974# Johns Hopkins Univ., Baltimore, Md. Dept. of Psychiatry.
SUSTAINED BLOOD PRESSURE RESPONDING DURING SYNTHETIC WORK
R. L. Ray and Henry H. Emurian 15 Jun. 1982 34 p refs
(Contract N00014-80-C-0467; NR Proj. 170-910)
(AD-A115733; ONR-TR-5) Avail: NTIS HC A03/MF A01 CSCL 06/5

In Experiment I, hour-long elevations in men blood pressure were elicited by the performance of a synthetic work task for both naive subjects and experienced subjects. Task-elicited changes in heart rate failed to reach significance although split-half reliabilities of both heart rate and mean blood pressure were high during task performance. Significant correlations were observed between performance effectiveness and cardiovascular response magnitude that differed in sign between experienced and naive groups. These data indicated the utility of the synthetic task for the study of sustained blood-pressure elevations elicited by work performance. In Experiment II, task-elicited blood pressure, heart rate, and respiration rate were reliably and persistently elicited during five five-minute trials for two consecutive daily sessions. Blood pressure response magnitude declined slightly over trials for both sessions, and this diminution in magnitude was attributable toa gradual rise in baseline levels. Examination of trial-by-trial data and the between-session correlations for baseline and response magnitude values suggests that task-elicited blood pressure and heart rate responses, and to a lesser extent respiration rate responses, constitute a highly stable system which changes slowly, if at all, with practice. Author (GRA)

N82-32975# San Francisco Univ., Calif. Inst. of Chemical Biology.
SURVEY OF TOXICITY AND CARCINOGENICITY OF MINERAL DEPOSITS Final Report
Arthur Furst and Ingeborg Harding-Barlow 3 Nov. 1981 101 p
(Contract W-7405-eng-48)
(DE82-003164; UCRL-15413) Avail: NTIS HC A06/MF A01

The toxicities and biogeochemical cycles of arsenic, cadmium, chromium, lead and nickel are reviewed in some detail, and other trace elements briefly mentioned. These heavy metals are used as a framework within which the problem of low level radioactive waste disposal can be compared. DOE

N82-32976# Environmental Protection Agency, Washington, D.C. Office of Noise Abatement and Control.
FIVE-YEAR RESEARCH PLAN FOR EFFECTS OF NOISE ON HEALTH
Dec. 1981 196 p
(PB82-168972; EPA-550/9-82-101) Avail: NTIS HC A09/MF A01 CSCL 06F

Categories of health effects of noise and priorities for any new research are presented: nonauditory physiologic effects, particularly, cardiovascular effects; sleep disturbance; individual and community response; noise induced hearing loss behavioral, social and performance effects; and communication interference. The research priorities, and results of recent research to arrive at a detailed plan including Multi-Component Research Initiatives are discussed. GRA

N82-32977# National Bureau of Standards, Washington, D.C.
X-RAY MEASUREMENTS AND PROTECTION, 1913-1964: THE ROLE OF THE NATIONAL BUREAU OF STANDARDS AND THE NATIONAL RADIOLOGICAL ORGANIZATIONS Final Report
Lauriston S. Taylor Dec. 1981 390 p refs
(PB82-165036; NBS-SP-625; LC-81-600158) Avail: NTIS HC A17/MF A01 CSCL 06R

A single source record of significant committee papers, correspondence, and decisions during the period 1913 to 1964, along with a summary of National Bureau of Standards work, and the interrelated efforts of many others in the scientific community is documented. A complete listing of the published output of the National Bureau of Standards' radiation staff is also included. The papers contribute significantly to the understanding of ionizing radiation. GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N82-32978# Colorado Univ., Boulder. Dept. of Psychology.
THE ROLE OF TEMPORAL OVERLAP OF VISUAL AND AUDITORY MATERIAL IN DUAL MEDIA COMPREHENSION
Patricia Baggett Apr. 1982 28 p refs
(Contract N00014-78-C-0433; NR Proj. 157-422)
(AD-A115714; ONR-113) Avail: NTIS HC A03/MF A01 CSCL 05/10

The forming of associations between the visuals and spoken material in a dual media presentation such as film or television are discussed. The role of the overlap in time of visual and auditory linguistic material is outlined. A 30 min. film which introduces an assembly kit, its pieces, their names, and some of their uses was shown. The film's visuals and narration was either presented in synchrony or could be shifted to the other up to 21 sec. Subjects saw the film in one of seven versions. It is found that the temporal order in which visual and auditory elements are presented influences the formation of dual media associations and that when auditory precedes visuals, much of the auditory component is lost. E.A.K.

N82-32979# Honeywell, Inc., Minneapolis, Minn. Systems and Research Div.
VISUAL SEARCH: CLUTTER AND PROXIMITY EFFECTS Final Technical Report
John R. Bloomfield, Jerry Wald, and Laura A. Thompson 1979 57 p refs
(Contract DAAK70-79-C-0032)
(AD-A115799) Avail: NTIS HC A04/MF A01 CSCL 17/8

The objective of the experimental program proposed in this report is to explore clutter and texture effects and to determine their usefulness as camouflage aids. Several perceptual experiments were conducted. The data from them can be used to help characterize the relation between a military target and its detectability in complex backgrounds. Such work in perception is a necessary step toward the development of camouflage standards for the prime visual threat. GRA

N82-32980# Air Force Human Resources Lab., Brooks AFB, Tex. Logistics and Technical Training Div.
ADVANCED INSTRUCTIONAL SYSTEM: APPLICATIONS FOR THE FUTURE
William A. Nunns Jul. 1982 11 p Presented at the Sci. and Eng. Symp., Wright-Patterson AFB, Ohio, 27-29 Oct. 1981
(AF Proj. 1121)
(AD-A117144; AFHRL-TP-81-45) Avail: NTIS HC A02/MF A01 CSCL 05/9

The Advanced Instructional System (AIS) was developed as a prototype computer-based training system to demonstrate the feasibility of administering and managing individualized instruction on a large scale. A secondary, but major, function of the AIS was to provide a research and development capability for evaluation of instructional innovations. Throughout the AIS development effort, there was a continual evolution in computer technology applicable to the instructional process. At the completion of development in 1977, the AIS incorporated state-of-the-art instructional techniques, media, and computer hardware and software. Since completion of the formal development phase, several major capabilities have been added to the system to support other Laboratory research efforts. What has evolved is a system that, in addition to supporting the full range of computer-based instructional functions, has capabilities to support flight scheduling, information retrieval, and materials development. As a result of several technology demonstrations conducted jointly by the Air Force Human Resources Laboratory (AFHRL) and the Major Commands, the Tactical Air Command (TAC). Strategic Air Command (SAC), and Military Airlift Command (MAC) have identified applications where implementation of this technology would improve their operational effectiveness and efficiency. These implementations could well be where the full benefit of the AIS technology to the Air Force would be realized. GRA

N82-32981*# Forschungsinstitut fuer Anthropotechnik, Bonn (West Germany).
STUDIES OF PLANNING BEHAVIOR OF AIRCRAFT PILOTS IN NORMAL, ABNORMAL AND EMERGENCY SITUATIONS
G. Johannsen, W. B. Rouse, and K. Hillmann Dec. 1981 92 p refs
(Grants NSG-2119; NAG-2-123)
(NASA-CR-169319; NAS 1.26:169319; FB-53) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10 CSCL 05I

A methodology for the study of planning is presented and the results of applying the methodology within two experimental investigations of planning behavior of aircraft pilots in normal, abnormal, and emergency situations are discussed. Beyond showing that the methodology yields consistent results, these experiments also lead to concepts in terms of a dichotomy between event driven and time driven planning, subtle effects of automation on planning, and the relationship of planning to workload and flight performance. Author (ESA)

N82-32982# Research Inst. of National Defence, Stockholm (Sweden).
DISTANCE ESTIMATION IN PROJECTED PHOTOGRAPHS
Henry Widen Apr. 1982 11 p refs
(FOA-C-56031-H2) Avail: NTIS HC A02/MF A01

Outdoor estimation of large distances, and estimation of the same distances in projected photographs was studied. Subjects made meter estimations of seven distances ranging from 205 to 1070 m, and other subjects estimated the same distances in photographs. The visual angles were the same in the two conditions, the viewing distance in the photograph condition was 150 cm. Progressively larger underestimation of distance in both conditions are shown. Standard deviations are large, and increase as a function of true distance. Analysis of variance shows no significant difference between photograph and outdoor conditions. It is concluded that it is possible to simulate terrain with photographs in experiments where parameters such as visibility must be controlled. Author (ESA)

N82-32983# European Space Agency, Paris (France).
CHANGES IN PSYCHOMETRIC COEFFICIENTS AND FACTOR STRUCTURE DUE TO PRACTICING PERFORMANCE TESTS
Klaus-Martin Goeters Dec. 1981 147 p refs Transl. into ENGLISH of "Die Aenderung der psychometrischen Kennwerte u. der Faktorenstruktur als Folge der Uebung von Tests" rept. DFVLR-FB-80-15 DFVLR, Bonn, Apr. 1980 152 p
(ESA-TT-686; DFVLR-FB-80-15) Avail: NTIS HC A01/MF A01; original German report available from DFVLR, Cologne DM 30,50

Practice effects on psychological test data were studied, using literature data and results from experiments. Analysis shows that improvement in performance associated with practice is expressed as a change in the mean which is associated with a change in variance in the same direction. There can be a systematic increase in results, depending on the scale, (e.g., using the number of correct answers as the measurement) or a systematic decrease (e.g., using solution times). Coefficients of variation remain substantially constant. In every case, the reliabilities increase. It is shown that the specific factor based on the Fleishman paradigm is not a practice factor in the sense of being a new factorial variance. This factor is probably a methodological artifact as the test variance remains substantially homogeneous with practice. Author (ESA)

N82-32984# Forschungsinstitut fuer Anthropotechnik, Bonn (West Germany).
COMPARATIVE EVALUATION OF METHODS FOR THE MEASUREMENT OF MENTAL WORKLOAD DURING A SIMPLE SIMULATED CAR DRIVING TASK [VERGLEICHENDE BEWERTUNG VON METHODEN ZUR MESSUNG DER MENTALEN BEANSPRUCHUNG BEI EINER VEREINFACHTEN SIMULIERTEN KFZ-FUEHRUNGSFGABE]
C. Pfendler Oct. 1981 88 p refs In GERMAN; ENGLISH summary
(FB-51) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 10

A graphic rating scale, a secondary task mean cardiac interval time, and four measures of heart rate variability were used to assess mental workload in a simulated car driving task and were compared on the basis of reliability and validity. The difficulty of the car driving task was varied in three levels by changing the cutoff frequency of the forcing function. Tracking error in the simulated car driving task significantly increases with higher difficulty levels. Graphic rating scale scores also increase significantly with primary task difficulty levels. Internal consistency of the rating scale is satisfactory. Secondary task error as a measure has a retest reliability good for group comparisons, but not for individual comparisons. Its validity as workload indicator is lower than that of the rating scale. Of all workload assessment procedures used, cardiac measures have the highest retest reliabilities The validity of the cardiac variables as workload indicators is low. Only one measure of heart rate variability differentiates approximately along with the secondary task scores. Author (ESA)

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N82-32985*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HEAT RESISTANT PROTECTIVE HAND COVERING Patent Application
Richard P. Tschirsh (Little (Arthur D.), Inc., Cambridge, Mass.), Kenneth R. Sidman (Little (Arthur D.), Inc., Cambridge, Mass.), and Irving J. Arms, inventors (to NASA) (Little (Arthur D.), Inc., Cambridge, Mass.) Filed 30 Jun. 1982 16 p Sponsored by NASA
(NASA-Case-MSC-20261-1; US-Patent-Appl-SN-393586) Avail: NTIS HC A02/MF A01 CSCL 06Q

A heat-resistant, protective glove having a shell made of a fabric of a temperature-resistant aromatic polyamide fiber is described. The outer surface of the shell is coated with a five-resistant elastomers and a liner, generally conforming and secured to the shell and disposed inwardly of the shell, the lines being made of a felt fabric of temperature-resistant aromatic polymide fiber. NASA

N82-32986*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HEAT RESISTANT PROTECTIVE HAND COVERING Patent Application
Richard P. Tschirsh (Little (Arthur D.), Inc., Cambridge, Mass.), Kenneth R. Sidman (Little (Arthur D.), Inc., Cambridge, Mass.), and Irving J. Arms, inventors (to NASA) (Little (Arthur D.), Inc., Cambridge, Mass.) Filed 30 Jun. 1982 17 p Sponsored by NASA
(NASA-Case-MSC-20261-2; US-Patent-Appl-SN-393581) Avail: NTIS HC A02/MF A01 CSCL 06Q

A heat-resistant protective glove having first and second shells which generally define the palm and back sides of the glove is described. The shell sections are made of a temperature-resistant aromatic polyamide fiber; the first, a twill weave and the second, a knitted fabric. The first liner has a flame-resistant, elastomeric coating on a surface contiguons to the inner surface of the first shell section. A second liner is located inwardly of the second shell section. The liner sections are comprised of a temperature-resistant aromatic polyamide fiber felt fabric. NASA

N82-32987*# San Jose State Univ., Calif. Dept. of Chemistry.
MINERAL SEPARATION AND RECYCLE IN A CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM (CELSS)
E. Vernon Ballou Mar. 1982 56 p refs
(Contract NCC2-53)
(NASA-CR-166388; NAS 1.26:166388; CELSS-18) Avail: NTIS HC A04/MF A01 CSCL 06K

The background of the mineral nutrition needs of plants are examined along with the applicability of mineral control and separation to a controlled ecological life support system (CELSS). Steps that may be taken in a program to analytically define and experimentally test key mineral control concepts in the nutritional and waste processing loops of a CELSS are delineated. J.M.S.

N82-32988*# Georgia Inst. of Tech., Atlanta. School of Nuclear Engineering and Health Physics.
PREPARATION AND ANALYSIS OF STANDARDIZED WASTE SAMPLES FOR CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS (CELSS)
John L. Carden and Richard Browner Aug. 1982 30 p refs
(Contract NCA2-OR260-102)
(NASA-CR-166392; NAS 1.26:166392; CELSS-20) Avail: NTIS HC A03/MF A01 CSCL 06K

The preparation and analysis of standardized waste samples for controlled ecological life support systems (CELSS) are considered. Analysis of samples from wet oxidation experiments, the development of ion chromatographic techniques utilizing conventional high pressure liquid chromatography (HPLC) equipment, and an investigation of techniques for interfacing an ion chromatograph (IC) with an inductively coupled plasma optical emission spectrometer (ICPOES) are discussed. Author

N82-32989*# Life Systems, Inc., Cleveland, Ohio.
PREPROTOTYPE NITROGEN SUPPLY SUBSYSTEM DEVELOPMENT Contractor Final Report
D. B. Heppner, J. H. Fort, and F. H. Schubert Jun. 1982 100 p refs
(NASA-CR-166379; NAS 1.26:166379) Avail: NTIS HC A05/MF A01 CSCL 06K

The design and development of a test stand for the Nitrogen Generation Module (NGM) and a series of tests which verified its operation and performance capability are described. Over 900 hours of parametric testing were achieved. The results from this testing were then used to design an advanced NGM and a self contained, preprototype Nitrogen Supply Subsystem. The NGM consists of three major components: nitrogen generation module, pressure controller and hydrazine storage tank and ancillary components. The most important improvement is the elimination of all sealing surfaces, achieved with a total welded or brazed construction. Additionally, performance was improved by increasing hydrogen separating capability by 20% with no increase in overall packaging size. Author

N82-32990# Air Force Systems Command, Brooks AFB, Tex. Applications and Liaison Office.
PROGRAMS IN EDUCATION AND TRAINING OF MANPOWER AND PERSONNEL, INCLUDING LOGISTICS AND GROUP ASPECTS OF HUMAN FACTORS ENGINEERING Final Annual Report, fiscal year 1981
Ruth M. Buescher Jun. 1982 160 p
(AF Proj. 9981)
(AD-A116275; AFHRL-TP-82-27) Avail: NTIS HC A08/MF A01 CSCL 05/1

The Air Force Human Resources Laboratory (AFHRL) mission, corporate philosophy, and descriptions of its research and development (R&D) thrusts are presented. Fiscal Year 1981 technica achievements and ongoing R&D are organized under each thrust area. AFHRL organizational structure, the functions of its divisions and staff offices, available technical resources, and publications and presentations by Laboratory personnel during Fiscal Year 1981 are included. Author

N82-32991# Federal Aviation Administration, Washington, D.C.
A SYSTEMS ENGINEERING EVALUATION METHOD FOR PILOTED AIRCRAFT AND OTHER MAN-OPERATED VEHICLES AND MACHINES. APPENDIX D: A UNIFYING SET OF HYPOTHESES FOR DYNAMIC SYSTEM TEST AND EVALUATION; THE RATING AND MEASUREMENT OF SYSTEM PERFORMANCE, SYSTEM LOAD, AND SYSTEM WORK AND THEIR INTERRELATIONSHIPS Final Report
Thomas H. Higgins 27 Apr. 1982 15 p refs
(AD-A115601; FAA-RD-81-30-ADD) Avail: NTIS HC A02/MF A01 CSCL 05/8

A set of equations, definitions, symbols, units of measurement and an equal interval scale providing an equal interval unit rating and measurement method for system evaluation are presented. The objective is to provide a unified approach to the systems engineering evaluation, rating and measurement of a dynamic system. The equations present the hypothsized relationships between system ratings and system measures of performance, work, and load. An equal interval, one-tenth power of ten, scale with ten as the highest rating is introduced for the rating, measuring, and communicating system performance, work, and load factors. These factors are of increasing interest during early R&D system dyhamic simulation concept testing and later operational system test and evaluation. Author (GRA)

N82-32992# Naval Air Development Center, Warminster, Pa.
DEVELOPMENT OF THE HELICOPTER CREWMAN JACKET Final Report
Jules Z. Lewyckyj Jan. 1982 54 p refs
(AD-A115635; NADC-82122-60) Avail: NTIS HC A03/MF A01 CSCL 06/17

This jacket, to be worn by Helicopter Mobile Crewmen or Helicopter passengers, provides for insulation and flotation to a wearer forced into cold water. It consists of an outer fire resistant aramid shell, a vest-like bladder attached to the shell and a layer of insulation. This bladder can be inflated thru a CO2 inflation device by a pull on a beaded handle. It can also be inflated orally. When inflated, the jacket will keep the wearer face-up in the water. GRA

N82-32993# Perceptronics, Inc., Woodland Hills, Calif.
AN EXPERIMENTAL EVALUATION OF TACTICAL SYMBOL-DESIGN FEATURES Annual Technical Report, 16 Mar. 1979 - 15 Mar. 1980
Michael G. Samet, Ralph E. Geiselman, and Betty M. Landee

1 Apr. 1980 69 p refs
(Contract DAHC19-78-C-0018; DA Proj. 2Q7-62722-A-765)
(AD-A115895; PATR-1063-80-4-2; ARI-TR-498) Avail: NTIS HC A04/MF A01 CSCL 05/10

Sixteen non-military participants learned each of two symbol sets (conventional, iconic) to a criterion. Each set contained three basic symbols representing unit types of armor, mechanized infantry, and infantry. After learning a symbol set, each participant was shown a series of situation displays, where some displays contained symbols coded with either perimeter-density or vector projection to convey supplementary unit-attribute information (unit strength or firepower reach) needed for typical tactical tasks. For each display, the participant was asked questions corresponding to different behavioral processes (identification, search, comparison, pattern recognition). Overall, the results suggested that iconic symbols may not necessarily be preferable to conventional symbols in certain situations; and, although the portrayal of supplemental unit information can slow some aspects of information processing, certain symbol-design features appear to create less interference than others. In a supplementary task which required integration of information from several symbols into an analytical judgment (threat value assessment), performance accuracy was found to be insensitive to the conventional versus iconic symbology comparison. The results were discussed in terms of the complexity of the implications involved in the selection of symbol design features and their correspondence with tactical concepts. GRA

N82-32994# Geo-Centers, Inc., Newton, Mass.
SAFETY ANALYSIS FOR NAVAL LIQUID OXYGEN LIFE SUPPORT SYSTEM
May 1982 37 p refs
(Contract N00014-81-C-2307)
(AD-A115742; GC-TR-82-220) Avail: NTIS HC A03/MF A01 CSCL 06/11

This research effort has examined both the generic hazards of the use of liquid oxygen (LOX) in a closed (submarine) environment and specific concerns relative to a current candidate design. In the generic analysis, more than 200 accidents involving LOX were investigated, and a chart showing the distribution of identifiable cases is shown in figure 1. This analysis identified the four most common causes, in descending order of frequency, as follows: contamination of LOX system with hydrocarbons, operator error, improper maintenance, and an unknown. The large number of cases in the unknown category reflects the often catastrophic nature of a LOX accident in which much of the evidence is destroyed. A similar analysis, conducted by Zabetakis, (3) identified a similar array of causes: mechanical failure of cryogenic components due to low temperature fatigue or component freeze-up, reaction of LOX with the containment vessel or auxiliary equipment, reaction of LOX with a contaminant, failure of safety devices, and operator error. GRA

N82-32995# California Univ., San Diego. Center for Human Information Processing.
FIVE PAPERS ON HUMAN-MACHINE INTERACTION
Donald A. Norman May 1982 37 p refs Sponsored in part by AFOSR
(Contract N00014-79-C-0323; NR Proj. 157-437)
(AD-A116031; CHIP-112; ONR-8205) Avail: NTIS HC A03/MF A01 CSCL 05/8

This report consists of five brief papers on different aspects of human-machine interaction. The first paper, 'Some Observations on Mental Models,' discusses the role of a person's mental model in the interaction with systems. The second paper, 'A Psychologist Views Human Processing: Human Errors and other Phenomena Suggest Processing Mechanisms' discusses the differences between conventional digital processing structures (the Von Neumann machine) and the mechanism of the human. The third paper, 'Steps toward a Cognitive Engineering,' shows how analysis of error can lead to design principles. The fourth paper, 'The Trouble with UNIX,' is an informal critique of the UNIX operating systems. The final paper, 'The Trouble with Networks,' describes some of the computer interactions that resulted from the distribution of the fourth paper. Author (GRA)

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N82-32996# Software Engineering Associates, Inc., Torrance, Calif.
JOVIAL/ADA MICROPROCESSOR STUDY Final Technical Report, Apr. 1980 - Nov. 1981
Terence E. Devine, Terry L. Dunbar, Michael B. Littlejohn, and Kerry White Griffiss AFB, N.Y. RADC Apr. 1982 199 p refs
(Contract F30602-80-C-0153; AF Proj. 5581)
(AD-A116352; RADC-TR-82-61) Avail: NTIS HC A09/MF A01 CSCL 09/2

The initial intent of this effort was to study the Microprocessor industry for a period of eighteen months and to configure a Microprocessor System capable of hosting an Ada compiler or at least a JOVIAL/J73 compiler. Shortly into the study, the JOVIAL portion of the effort was eliminated. Basically, the study investigated the following areas: (1) current and future microprocessors technology, (2) existing compilers on small hosts, (3) advantages and disadvantages of hosting a development system on a microprocessor, (4) ada language issues, and (5) the design of an Ada Integrated Environment (AIE) for a microprocessor. The study concluded that a workable Ada capability can be hosted on a Motorola MC68000, Zilog Z8000, Intel 8086, Intel 432 or the soon-to-be-marketed National Semiconductor 16032. A practical micro-based system would support one of the above mentioned microprocessor, a terminal (CRT or hand copy), floppy disks, a Winchester disk, applicable disk controllers and 256 Bytes of RAM. Obviously, each application directs the particular hardware required to satisfy that application. At the time of this report, several manufactors were advertising partial implementations of Ada hosted on a variety of hardware configurations. Author (GRA)

N82-32997# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ANALYSIS AND DESIGN OF INTERACTIVE DEBUGGING FOR THE ADA PROGRAMMING SUPPORT ENVIRONMENT M.S. Thesis
Richard L. Gaudino Nov. 1981 112 p refs
(AD-A115636; AFIT/GCS/MS/MA-81D-3) Avail: NTIS HC A06/MF A01 CSCL 09/2

The design and implementation of a skeletal interactive Ada debugger on a DEC-10 computer is described. An analysis of current debugging technology was performed to formulate a basis for the debugger tool development. The tools implemented were

breakpoints, single step and multistep execution, the display and modification of program variables, and other miscellaneous options. Because of the lack of information on current software debugging methods, it is concluded that more emphasis is needed in techniques and tools for debugging of programs and the human interfacing techniques. J.D.

N82-32998# Center for Naval Analyses, Alexandria, Va. Operations Analysis Group.

SOME MATHEMATICAL METHODS FOR MODELING THE PERFORMANCE OF A DISTRIBUTED DATA BASE SYSTEM

C. Bernard Barfoot Jun. 1982 25 p refs Presented at the Intern. Working Conf. on Model Realism, Bad Honnef, West Germany, 20-23 Apr. 1982

(Contract N00014-76-C-0001)

(AD-A116604; CNA-PP-353) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper presents some mathematical methods for evaluating the performance of a distributed data base system (DDBS). Performance is measured by the speed and accuracy with which data are transmitted from one location to another. Five techniques are described: the Data Flow Model, a semi-Markov model for determining the spatial and temporal distribution of data that are to be transferred from one location to another; Optimal Sample Size Estimation, a method for determining the amount of data to be collected for input to the Data Flow Model; Confidence Interval Estimation, a method for estimating confidence intervals for the outputs of the Data Flow Model; Sensitivity Estimation, a method for estimating the sensitivity of DDBS performance to changes in the parameters of the Data Flow Model; and the Aggregation of Stratified Semi-Markov Processes, a method for combining semi-Markov Data Flow Models developed for subsystems (e.g., geographic regions) into a single model that is representative of the entire DDBS. Author (GRA)

N82-32999# University of Southern California, Marina del Rey. Inst. of Information Sciences.

A RESEARCH PROGRAM IN COMPUTER TECHNOLOGY, VOLUME 1 Annual Technical Report, Oct. 1979 - Sep. 1980

Keith W. Uncapher Aug. 1981 148 p refs 2 Vol.

(Contract DAHC15-72-C-0308; ARPA Order 2223)

(AD-A115915; ISI/SR-81-19-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 09/2

This report summarizes the research performed by USC/Information Sciences Institute from October 1, 1979, to September 30, 1980, for the Defense Advanced Research Projects Agency. The research applies computer science and technology to areas of high DoD/military impact. The ISI program consists of fourteen research areas: Specification Acquisition From Experts study of acquiring and using program knowledge for making informal program specifications more precise; Program Verification - logical proof of program validity; Autopsy - research on source-to-source program translation combining automatic techniques with an interactive system to provide the human manager complete control over the translation process; Formal Semantics - development of tools and methodologies to support the formulation of precise, readable, and accurate formal semantic definitions; Cooperative Interactive Systems - construction of a system to provide natural input/output and help facilities for users of interactive services; Command and Control Graphics - development of a device-independent graphics system and graphics-oriented command and control applications programs; Internetwork Concepts exploring aspects of protocols for the interconnection of computer communication networks, specifically the design and prototype implementation of an internetwork computer message system and the design of internetwork host and gateway protocols. GRA

N82-33000# University of Southern California, Marina del Rey. Inst. of Information Sciences.

A RESEARCH PROGRAM IN COMPUTER TECHNOLOGY, VOLUME 2 Annual Technical Report, 1 Dec. 1979 - 30 Sep. 1980

Keith W. Uncapher Aug. 1981 25 p refs 2 Vol.

(Contract MDA903-80-C-0523; ARPA Order 2223)

(AD-A115584; ISI/SR-81-20-VOL-2) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report summarizes the research performed by USC/Information Sciences Institute from December 1, 1979, to September 30, 1980, for the Defense Advanced Research Projects Agency under contract MDA903-80-C-0523. The ISI program covered by this contract consisted of three research areas: VLSI development of a low-cost, fast turnaround LSI/VLSI device fabrication service to support VLSI research, and research on the VLSI design problem; Strategic C3 System Experiment Support - development of a detailed technical plan for the creation of a survivable message system and data bases through multiple copies of the critical components and data cross the ARPANET and provision of the core facilities necessary to implement the plan; Interlisp - development and maintenance of a portable, large address-space Interlisp implementation. Author (GRA)

N82-33001# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

THE DESIGN AND IMPLEMENTATION OF A DATA FLOW MULTIPROCESSOR M.S. Thesis

Michael W. Bray Dec. 1981 157 p refs

(AD-A115616; AFIT/GCS/EE/81D-5) Avail: NTIS HC A08/MF A01 CSCL 09/2

This report presents a data flow multiprocessor designed and implemented with standard laboratory microcomputer boards. Intel SBC 80/20 small board computers were used since their design supported a multibus structure required for multiprocessing. Current data flow techniques were researched in order to find a technique that could be implemented through software. A packet communication architecture was chosen for implementation since other data flow techniques required specialized hardware. The requirements of the multiprocessor were defined using structured analysis techniques. These requirements were then translated into structured modulas. The software modules were then implemented and tested in a top down approach. The data flow multiprocessor software was tested by executing complete data flow programs. The results of the tests demonstrated the functionality of the multiprocessor. However, the multiprocessor software was limited in some respects. The memory allocated for the storage of data flow programs limited the maximum number of data flow instructions that could be represented to only 128. The mathematical operations were also limited in that only 8 bit computations were allowed. GRA

N82-33002# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

DESIGN AND DEVELOPMENT OF A MULTIPROGRAMMING OPERATING SYSTEM FOR SIXTEEN BIT MICROPROCESSORS M.S. Thesis

Mitchell S. Ross Dec. 1981 293 p refs

(AD-A115614; AFIT/GCS/EE/81D-14) Avail: NTIS HC A13/MF A01 CSCL 09/2

A timesharing operating system for the Air force Institute of Technology Digital engineering laboratory was designed and developed with emphasis on the human interface. The functional requirements were developed by a thorough literature search on the user perceptions of computer operating systems and the justification for the success of popular systems such as UNIX, TENEX, and UCSD PASCAL. Structured Analysis was used to produce a structured specification for the hierarchy of the operating system. The structured specification includes an operating system shell which allows a flexible user command structure, a hierarchical file structure, device independent input/output management, a scheduler which supports swapping, a general memory management scheme, and a system nucleus consisting of process dispatching, interrupt handling and interprocess communications. Weinberg's methodology, which is based on Yourdon and Constantine's Transform Analysis and Transaction Analysis Techniques, was used to develop the software design which consists of a set of module structure charts. The module structure charts are supported by data flow diagrams and a data dictionary. GRA

N82-33003# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THRUPUT ANALYSIS OF AFLC CYBER 73 COMPUTERS M.S. Thesis
LeRoy Talmadge Bondurant Dec. 1981 174 p refs
(AD-A115578; AFIT/GCS/EE/81D-2) Avail: NTIS HC A08/MF A01 CSCL 09/2

Supporting a request from AFLC/LMTA for assistance in evaluating the performance of their CYBER-73 computer system on an expanding workload, this thesis models and analyzes the existing workload in an effort to explain job elongation in turnaround time and to predict future performance under hypothesized changes. The workload of a selected typical month, July, 1981, was used as a baseline for the study. Through a systematic reduction and parameterization of job characteristics, the baseline data was clustered and statistically analyzed to detect trends in areas where job delay could occur. Performance models of elongation areas were subsequently developed, tuned, and varied to permit maximum workload optimization for the computer system. A 31 percent reduction in turnaround time was ultimately predicted from a series of 6 recommended changes in current procedures leading to a potential annual savings in excess of two and a third million dollars for the command's six computer installations. GRA

N82-33004# California Univ., Livermore. Lawrence Livermore Lab.
DEBUGGING IN A MULTI-PROCESSOR ENVIRONMENT
James M. Spann 29 Sep. 1981 5 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26-29 Oct. 1981 (Contract W-7405-eng-48)
(DE82-000638; UCRL-86132; CONF-811040-11) Avail: NTIS HC A02/MF A01

Debugging tools and software testing procedures for debugging programs of the Supervisory Control and Diagnostic System for the Mirror Fusion Test Facility are described. The system consists of nine 32-bit minicomputers arranged in a tightly coupled distributed computer system utilizing a share memory as the data exchange medium. DOE

N82-33005# Allied-General Nuclear Services, Barnwell, S.C.
EVALUATION OF IN-HOUSE VERSUS CONTRACT COMPUTER HARDWARE MAINTENANCE
Herbert P. Wright Sep. 1981 23 p
(Contract DE-AC09-78ET-35900)
(DE82-003280; AGNS-35900-2.3-147) Avail: NTIS HC A02/MF A01

The issue of in-house versus contract computer hardware maintenance is discussed. The advantages and disadvantages of both approaches to computer maintenance, the costs involved, and the maintenance experience to date are addressed. DOE

N82-33006# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
EVALUATION STUDY OF SPACECRAFT MICROCOMPUTER MODULE SYSTEM. APPLICABILITY TO THE MODULAR ATTITUDE CONTROL SYSTEM Final Report
J. W. Pengelly, comp. Paris ESA Feb. 1982 146 p
(Contract ESTEC-4704/81/NL-AK(SC))
(BAe-TP-7940; ESA-CR(P)-1607) Avail: NTIS HC A07/MF A01

The suitability of the microcomputer module system for the modular attitude control system was verified by determining attitude and orbit control subsystem (AOCS) requirements for a variety of missions. A single bus with 100 kHz clock speed to interconnect AOCS equipment is recommended. Either conventional or onboard data handling bus can be used for telemetry and telecommand. A 25V peak ac supply for constant power low voltage control circuits and a 50V ac supply for the actuator drive circuits with a mission specific power adaptor unit is proposed. Author (ESA)

N82-33007# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
DIGITAL EQUIPMENT CORPORATION VAX - 11/750, VAX 11 COBOL 74 VERSION 4.4
30 Dec. 1981 13 p
(PB82-168881; FCTC-81-40) Avail: NTIS HC A02/MF A01 CSCL 09B

This FCTC Technical Report for the DEC VAX 11 COBOL 74 Version 4.4 running under the VAX/VMS Version 2.4 provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O module of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the discrepancies found - if any. A companion report Validation Summary Report FCTC-18-134 provides information regarding the validation of the compiler as the Low-Intermediate level of Federal Standard COBOL (FIPS PUB 21-1). GRA

N82-33008# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
UNITED COMPUTING SYSTEMS, INC. CYBER 730 FORTRAN 5.0 LEVEL 528
30 Sep. 1981 12 p
(PB82-168899; FCTC-81-108) Avail: NTIS HC A02/MF A01 CSCL 09B

The Valdiation Summary Report (VSR) for the United Computing Services, Inc. CDC FORTRAN 5.0 running under the APEX D.4.2 operating system provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-33009# American National Standards Inst., New York.
ANSI/X3/SPARC DBS-SG RELATIONAL DATABASE TASK GROUP Final Report
Michael L. Brodie, ed. and Joachim W. Schmidt, ed. Sep. 1981 175 p refs
(PB82-170051; NBS-GCR-82-379) Avail: NTIS HC A08/MF A01 CSCL 09B

A proposal for a relational DBMS standards project is presented. The features of current relational systems, architectural issues related to relational systems, and recommendations for developing a relational standard are discussed. GRA

N82-33010# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
STEVENS INSTITUTE OF TECHNOLOGY DEC SYSTEM-1091 SITGO FORTRAN, VERSION 4.0
30 Dec. 1981 12 p
(PB82-169020; FCTC-81-145) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Stevens Institute of Technology DEC System 1091 SITGO FORTRAN Version 4.0 running under the TOPS-10 Version 1.07 operating system provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 Fortran Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset level of the FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-33011# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
DIGITAL EQUIPMENT CORPORATION VAX-11/750, VAX-11 COBOL 74 VERSION 4.4
30 Dec. 1981 55 p
(PB82-168931; FCTC-81-134) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the DEC VAX 11 COBOL 74 Version 4.4 running under the VAX/VMS Version 2.4 provides a consolidated summary of the results obtained from the

validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-33012# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
DIGITAL EQUIPMENT CORPORATION PDP 11/60, PDP-11 FORTRAN-77 VERSION 4.0
30 Dec. 1981 12 p
(PB82-168923; FCTC-81-135) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the DEC PDP 11 FORTRAN 77 V.4.0 running under the RSX-11M Version 3.2 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-33013# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
DATA GENERAL CORPORATION ECLIPSE MV/6000, AOS/VS FORTRAN 77, REVISION 1.32
30 Oct. 1981 12 p
(PB82-168915; FCTC-81-121) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Data General Corporation MV/6000 AOS/VS FORTRAN 77 Rev 1.32 running under the AOS/VS Rev. 1.40 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-33014# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
DATA GENERAL CORPORATION ECLIPSE S/140 AOS FORTRAN 77, REVISION 1.00
30 Oct. 1981 12 p
(PB82-168907; FCTC-81-120) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Data General Corporation Eclipse S/140 AOS FORTRAN 77 Rev 1.00 running under the AOS Rev. 3.40 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N82-33015*# Intermetrics, Inc., Huntsville, Ala. Engineering Systems Group.
SEPAC FLIGHT SOFTWARE DETAILED DESIGN SPECIFICATIONS, VOLUME 1
30 Apr. 1982 343 p refs 2 Vol.
(Contract NAS8-34747)
(NASA-CR-169326; NAS 1.26:169326; IR-AL-002-Vol-1) Avail: NTIS HC A15/MF A01 CSCL 09B

The detailed design specifications (as built) for the SEPAC Flight Software are defined. The design includes a description of the total software system and of each individual module within the system. The design specifications describe the decomposition of the software system into its major components. The system structure is expressed in the following forms: the control-flow hierarchy of the system, the data-flow structure of the system, the task hierarchy, the memory structure, and the software to hardware configuration mapping. The component design description includes details on the following elements: register conventions, module (subroutines) invocation, module functions, interrupt servicing, data definitions, and database structure. Author

N82-33016*# Intermetrics, Inc., Huntsville, Ala.
SEPAC FLIGHT SOFTWARE PROGRAM LISTING, VOLUME 2
30 Apr. 1982 521 p refs Sponsored by NASA 2 Vol.
(NASA-CR-169327; NAS 1.26:169327; IR-AL-002-Vol-2) Avail: NTIS HC A22/MF A01 CSCL 09B

The program listing for the SEPAC flight software is provided. N.W.

N82-33017*# Systems and Applied Sciences Corp., Hampton, Va.
DOCUMENTATION OF PROGRAM COORDC TO GENERATE AND COORDINATE SYSTEM FOR 3D CORNERS WITH OR WITHOUT FILLET USING BODY FITTED CURVILINEAR COORDINATES, PART 2
Dilip Kumar Jun. 1980 59 p refs
(Contract NAS1-15604)
(NASA-CR-159279; NAS 1.26:159279; R-SAL-06/80-03-Pt-2) Avail: NTIS HC A04/MF A01 CSCL 09B

The computer program COORDC generates a body fitted curvilinear coordinate system for corner geometry with or without corner fillets. It is assumed that at any given xi, x remains constant; consequently the only variation is in y and z. It is also assumed that for all xi's in the physical plane the coordinate system in y-z plane is similar. This enables solution of coordinate system for one particular xi = 1 (x for xi = 1 is arbitrarily chosen to be 0.0) and the solution for all other xi plane can be easily specified once the coordinates in the physical plane on the line 1 < or = to xi < or = to IMAX, eta = 1, zeta = 1 are specified. Author

N82-33018*# Auburn Univ., Ala. Dept. of Electrical Engineering.
STANDARD TRANSISTOR ARRAY (STAR): SIMLOG/TESTGN PROGRAMMER'S GUIDE, VOLUME 2, ADDENDUM 2 Final Report
B. D. Carroll 14 Sep. 1979 137 p refs
(Contract NAS8-31572)
(NASA-CR-161328; NAS 1.26:161328) Avail: NTIS HC A07/MF A01 CSCL 12A

A brief introduction to the SIMLOG/TESTGN system of programs is given. SIMLOG is a logic simulation program, whereas TESTGN is a program for generating test sequences from output produced by SIMLOG. The structures of the two programs are described. Data base, main program, and subprogram details are also given. Guidelines for program modifications are discussed. Commented program listings are included. Author

N82-33019*# Atsuko Computing International, Huntsville, Ala.
AVE-SESAME PROGRAM FOR THE REEDA SYSTEM Final Report
John S. Hickey 21 May 1982 6 p
(Contract NAS8-33844)

(NASA-CR-162078; NAS 1.26:162078; ACI-052182-F) Avail: NTIS HC A02/MF A01 CSCL 09B

The AVE-SESAME Software developed by ACI on the REEDA System Computer is described. This software processes the AVE-SESAME Severe Storm data and generates various statistical and graphical outputs. Author

N82-33020*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

AUTOMATED PROCEDURE FOR DEVELOPING HYBRID COMPUTER SIMULATIONS OF TURBOFAN ENGINES. PART 1: GENERAL DESCRIPTION

John R. Szuch, Susan M. Krosel, and William M. Bruton Aug. 1982 120 p refs

(NASA-TP-1851; E-779; NAS 1.60:1851) Avail: NTIS HC A06/MF A01 CSCL 09B

A systematic, computer-aided, self-documenting methodology for developing hybrid computer simulations of turbofan engines is presented. The methodology that is pesented makes use of a host program that can run on a large digital computer and a machine-dependent target (hybrid) program. The host program performs all the calculations and data manipulations that are needed to transform user-supplied engine design information to a form suitable for the hybrid computer. The host program also trims the self-contained engine model to match specified design-point information. Part I contains a general discussion of the methodology, describes a test case, and presents comparisons between hybrid simulation and specified engine performance data. Part II, a companion document, contains documentation, in the form of computer printouts, for the test case. Author

N82-33021# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

IMAGE PROCESSING SYSTEMS: A COMPARATIVE ANALYSIS

Flavio Roberto Dias Velasco Jul. 1982 35 p refs

(INPE-2464-NTE/188) Avail: NTIS HC A03/MF A01

The IDIMS (ESL Inc.), System 101 (STL/I2S), ARIES-II (Dipix Systems) and LARSYS (Laboratory for Applications of Remote Sensing - LARS) image processing systems are overviewed and compared in their software and hardware aspects. Emphasis is given to the application software. Author

N82-33022# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

SOFTWARE DEVELOPMENT ACTIVITIES IN IMAGE PROCESSING

Mucio Roberto Dias, Nelson de Jesus Parada, Flavio Roberto Dias Velasco, Ubirajara M. Barsotti Lima, Celso deRennaeSouza, and Gilberto Camara Neto May 1982 17 p refs

(INPE-2392-RA/162) Avail: NTIS HC A02/MF A01

An overview of software development activities related to image processing is presented. These activities are grouped into five projects and the goals associated with each project are described. The STIM project which aims at the development of an image processing system based on a 16 bit machine is emphasized. The hardware and software facilities in the IMAGE 100 system are described. S.L.

N82-33023 Royal Signals and Radar Establishment, Malvern (England).

CONTROL OF THE NICOLET 446b SPECTRUM ANALYSER VIA THE IEEE-48 BUS USING AN HP-85 DESK-TOP COMPUTER

Paul A. Manning 1982 31 p refs

(RSRE-Memo-3445; BR83148) Copyright. HC A03/MF A01

A computer program which controls CCD spectrum analyzer functions, and which enables data to be stored on magnetic tape cassettes, is presented. Information needed to modify the software to meet user requirements is given. Author (ESA)

N82-33024# National Physical Lab., Teddington (England). Div. of Information Technology and Computing.

A PSEUDO-RANDOM NUMBER GENERATOR

B. A. Wichmann and I. D. Hill (Clinical Res. Center, Harrow, Engl.) Jun. 1982 36 p refs

(NPL-DITC-6/82; ISSN-0143-7348) Avail: NTIS HC A03/MF A01

A number generator was subjected to serial, poker, coupon collector, and runs up and down tests. Algorithm properties are analyzed. Pocket calculator and ADA versions of the original FORTRAN program are presented. Author (ESA)

N82-33025# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

DEVELOPMENT OF A MICROPROCESSOR-BASED ASYNCHRONOUS DATA COMMUNICATIONS LINE TESTER M.S. Thesis

David L. Hartmann Dec. 1981 185 p refs

(AD-A115560; AFIT/GCS/EE/81D-11) Avail: NTIS HC A09/MF A01 CSCL 09/2

Software to support a microprocessor-based asynchronous data communications line tester which operates on digital data is described. The software functions included a monitor mode and a simulate mode both of which can be executed through interactive dialogue with the operator of the system. The software was to reside in PROM and execute upon power up and reset. A structured top down approach was used to design a transaction oriented software line tester. Data line testing was performed through the serial input/output, utilizing its interrupt mode and status gathering capabilities to capture error conditions. The software, written in Z-80 Assembly language, was tested using both white box and black box testing strategies. The microprocessor-based line tester proved to be versatile and efficient in performing asynchronous data communication line testing. J.D.

N82-33026# Air Force Weapons Lab., Kirtland AFB, N. Mex.

COMPUTER GRAPHICS FOR SCIENTIFIC APPLICATIONS Final Report

Lawrence A. Feldman and Nazareno L. Rpagnani Feb. 1982 78 p refs

(AD-A116303; AFWL-TR-80-133) Avail: NTIS HC A05/MF A01 CSCL 09/2

An overview of computer graphics and its potential contribution in the analysis of scientific and engineering data is given, and is directed to the engineer familiar with computer modeling and analysis, but not with computer visualization techniques important in treating complex results. Standard graphics hardware and software are discussed, with emphasis on recent advances made by the computer graphics industry. Covered are diverse technical applications including two- and three-dimensional dynamic simulations and the software techniques employed to visualize the results of these calculations. Realism (employing shading algorithms to make artificial graphics appear real and lifelike) is investigated. An approach to writing a complete multidimensional scientific animation graphics package, SCAN, is detailed. The challenge of dealing with the voluminous data generated by three dimensional numerical modeling encouraged the development of such a program. The objectives, architecture, and results are briefly described; and future trends in computer graphics and their immediate impact on existing computer analysis are explored. R.J.F.

N82-33027# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.

WOLFQP, WOLFE'S METHOD FOR QUADRATIC PROGRAMMING

John W. Wingate and Jeffrey S. Youngs 17 Mar. 1981 94 p

(AD-A116288; NSWC-TR-82-30) Avail: NTIS HC A05/MF A01 CSCL 09/2

A FORTRAN routine, WOLFQP, for solving quadratic programming problems is documented. Theory, usage notes, and examples are included. M.G.

N82-33028# Tennessee Univ. Space Inst., Tullahoma. Div. of Gas Diagnostics Research.

ADAPTIVE CORRELATION CONCEPTS FOR NON-COMPATIBLE IMAGERY Final Technical Report, 15 Aug. 1980 - 15 Aug.

1981
Lewis J. Pinson and J. C. Su 31 Oct. 1981 88 p refs
(Grant AF-AFOSR-0275-80; AF Proj. 2305)
(AD-A116069; AFOSR-82-0484TR) Avail: NTIS HC A05/MF A01 CSCL 09/2

As a result of characterizing joint scene content in terms of the joint probability density function, a new registration metric was defined as the threshold difference (TD) method. It produced a sharper correlation peak than other pixel-by-pixel methods investigated. Analytical comparisons and simulations were done to show the effects of scene content on registrations by direct cross correlation, mean absolute difference and thresholded difference methods. Author (GRA)

N82-33029# Pennsylvania Univ., Philadelphia. Dept. of Computer and Information Sciences.
MODEL PROGRAM GENERATOR: SYSTEM AND PROGRAMMING DOCUMENTATION, SPRING 1982 VERSION
Kang-Sen Lu May 1982 169 p refs
(Contract N00014-76-C-0416; NR Proj. 049-153)
(AD-A116161) Avail: NTIS HC A08/MF A01 CSCL 09/2

This document describes the algorithms and mechanisms of the MODEL Processor, which is a software system performing a program writing function. It also documents the program structure and procedures of the Processor. The MODEL Processor has been designed to automate the program design, coding and debugging of software development, based on a non-procedural specifications of a program module in the MODEL language. A program module is formally described and specified in the MODEL language, whose statements are then submitted to the Processor. The set of MODEL statements describing a program module is referred to as a specification. The Processor, performs the analysis (including checking for the completeness and consistency of the entire specification), program module design (including generating a flowchart-like sequence of events for the module), and code generation functions, thus replacing the tasks of an application programmer/coder. The Processor's capability to process a non-procedural specification language is built on application of graph theory to the analysis of such specification and to the program generation task. Another important function of the Processor is to interact with the specifier to indicate necessary supplements or changes to the submitted statements. The Processor produces a complete PL/1 program ready for compilation as well as various reports concerning the specification and the generated program. GRA

N82-33030# Dayton Univ., Ohio.
USER'S GUIDE FOR COMBIMAN PROGRAMS (COMPUTERIZED BIOMECHANICAL MAN-MODEL), VERSION 5 Technical Interim Report
P. Bapu, P. Kikta, M. Korna, and J. McDaniel Wright-Patterson AFB, Ohio Aerospace Medical Research Lab. Apr. 1982 348 p refs
(Contract F33615-78-C-0507; AF Proj. 7184)
(AD-A116281; AFAMRL-TR-81-151; UDR-TR-81-80) Avail: NTIS HC A15/MF A01 CSCL 05/2

This user's guide describes the procedures to operate the Air Force Aerospace Medical Research Laboratory's (AFAMRL) COMputerized Biomechanical MAN-model (COMBIMAN) programs. The guide, based on the programs as of 1 May 1981, includes an introduction to the man-model and the conventions used to develop and analyze crew station configurations. It also deals with the operations of the programs included in the COMBIMAN system. These programs include an interactive graphics program CBM05, and three key file creation/modification programs which create and maintain the Data Bases of anthropometric surveys, crew station configurations, and visibility contour definitions. The guide also contains a complete description of the use of the off-line plot program. The guide to operate the four main programs includes descriptions of the available processing for each program, definitions and examples of all input and output data formats, procedures to load the programs, and explanations of all diagnostic messages generated by the programs. GRA

N82-33031# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va. Human Factors Technical Branch.
DESIGN RECOMMENDATIONS FOR QUERY LANGUAGES
S. L. Ehrenreich Sep. 1980 45 p refs
(DA Proj. 2Q1-62717-A-790)
(AD-A115894; ARI-TR-484) Avail: NTIS HC A03/MF A01 CSCL 09/2

The existing human factors literature on query language is both sparse and scattered. This paper seeks to collect and review that literature. The first section of the paper introduces the subject of query languages. In the second and third sections, the topics of natural and formal query languages are respectively discussed. These two types of query languages are reviewed with the objective of determining their potential for expanding the population of computer users. The fourth section considers some general issues pertinent to both types of query languages. These issues include the ability of people to deal with logical quantifiers, the user's concept of data organization, mixed initiative dialogues, and the use of abbreviations. Methods for experimentally evaluating specific query language features and research on person-to-person communication are also discussed here. To focus the findings reported in the preceding sections, the fifth section summarizes the implications of the research performed to date. Next, the sixth section presents possible new research which would be of value to the designers of Army tactical information systems. The paper concludes with two appendixes. Appendix A discusses human factors review papers concerned with the design of interactive systems. Appendix B presents a compendium of design recommendations directed towards the system designer. Author (GRA)

N82-33032# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DEVELOPMENT OF AN 8086 MULTIPROGRAMMING SYSTEM M.S. Thesis
Robert J. Yusko Dec. 1981 192 p refs
(AD-A115682; AFIT/GE/EE/81D-61) Avail: NTIS HC A09/MF A01 CSCL 09/2

The initial design and development of an 8086 multiprogramming operating system for use at the Air Force Institute of Technology (AFIT) was begun with a detail design of the CPU Scheduler being completed. Also, the top-level system specification was defined based on the needs of the Digital Engineering Laboratory at AFIT. Structured Analysis and Design techniques were used to produce a structured specification for the CPU Scheduler. Transform and Transactional Analysis methods were then applied to the specifications to produce a detailed design of the scheduler in the form of structured charts and module (interface) specifications. GRA

N82-33033# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A UNIX BASED DEVICE DRIVER FOR THE VECTOR GENERAL 3404 GRAPHIC DISPLAY SYSTEM M.S. Thesis
Bradley Ray Stewart Mar. 1982 215 p refs
(AD-A115582; AFIT/GCS/MA/81D-6) Avail: NTIS HC A10/MF A01 CSCL 09/2

A device driver for the Vector General 3404 Graphics Display System was installed under the UNIX version seven operating system on a PDP11/60 computer. This was accomplished by modifying an existing device driver which was designed to run under version six of the UNIX operating system. The major topics addressed in this report are the C programming language, peripheral device I/O processing under UNIX, the hardware interface between the PDP11/60 and the graphics display system, the graphics display system itself, and the existing device driver software. Structure charts were used to document the design of the UNIX peripheral device I/O processing software and the design of the device driver software. Modifications to the original device driver were easily accomplished due to the top-down modular design of the original software. UNIX provided a straight-forward interface for adding the device driver software to the system. Author (GRA)

N82-33034# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MICROPROGRAMMING: A TOOL TO IMPROVE PROGRAM PERFORMANCE M.S. Thesis
John J. Steidle Dec. 1981 145 p refs
(AD-A115564; AFIT/GT/EE/81D-56) Avail: NTIS HC A07/MF A01 CSCL 09/2

A user microprogramming capability was implemented on AFIT's HP 21MX RTE-III computer system. The AFIT computer will be used to support student research in microprogramming projects involving real time digital signal processing and special time critical programs for military environments. This study further looks at a specific microprogramming technique to tailor application programs for improving a programs execution time. A feasibility study to analyze program activity for microprogram improvements is done for the fast Fourier transform. The Bit Reversal sorting routine is microcoded to demonstrate the technique. Response of the FFT programs is analyzed using an activity profile generator program, and the difference in execution speed of the programs with and without the microprogrammed bit reversal routine is measured and compared. Author (GRA)

N82-33035# Naval Air Development Center, Warminster, Pa.
ANALYSIS OF COVARIANCE COMPUTER PROGRAM WITH MULTIPLE COVARIATES AND FORECAST CAPABILITY Final Report
Joseph J. Franz 30 Apr. 1982 191 p refs
(AD-A115652; NADC-77036-30) Avail: NTIS HC A09/MF A01 CSCL 12/1

A standard analysis of covariance computer program with multiple covariates has been modified to include data forecast capability, covariate correlation and residual analyses for total and treatment groups. Author (GRA)

N82-33036# General Electric Co., Arlington, Va.
AN EMPIRICAL EVALUATION OF LANGUAGE-TAILORED PDLS
Deborah A. Boehm-Davis, Sylvia B. Sheppard, John W. Bailey, and Elizabeth Kruesi May 1982 49 p refs
(Contract N00014-79-C-0595)
(AD-A115632; GEC/ISP/TR-82-388200-6) Avail: NTIS HC A03/MF A01 CSCL 09/2

Recent research in the area of program documentation has demonstrated a superiority for coding with a detailed design written in a Program Design language (PDL) over other formats such as flowcharts. Because PDL is more code-like than other formats, there is less translation required in mapping from the design to the code. If the amount of translation is a critical underlying factor, the optimal PDL for any given implementation will be one that is tailored toward the particular language being used. This experiment evaluated the effectiveness of using a PDL specifically designed to aid in coding the corresponding programming language. This was done by designing PDLs which reflected the syntax and features of particular programming languages and by examining the performance of programmers coding from these various PDLs in one of two implementation languages. The results showed that (1) it took longer to code programs in MACRO-11 than in FORTRAN, (2) the shortest time to code the programs occurred when the coding language of the PDL matched the actual coding language, and (3) the errors made in coding while the type of problem did. The data suggest that programmers produce code most quickly from a form of documentation that is closest to the code. This research suggests that providing detailed design information in terms of a language-specific PDL will lead to a shorter coding period than when a language-independent PDL is used. GRA

N82-33037# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
A SYSTEM FAILURE DETECTION METHOD: FAILURE PROJECTION METHOD M.S. Thesis
Jun. 1982 94 p refs
(Contract N00014-77-C-0224)
(AD-A115979; LIDS-TH-1203) Avail: NTIS HC A05/MF A01 CSCL 09/2

This thesis proposes a system failure detection method: Failure Projection Method (FPM) which provides a geometric pictures of the problem of failure detection in the presence of model uncertainties and noise. The concept of FPM is thoroughly studied in this thesis. In particular, two groups of formulations have been developed. One gives distinct geometrical interpretation while the other is based on assuming that one has available a priori information on the system state. Within two groups three formulations which are based on slightly different criteria and have decreasing complexity of calculation are developed. The simplest require only a singular value decomposition. Also two numerical examples are given which show the relationship among these formulations and thus provide a deep understanding of their nature. An algebric approach is developed for the generation of a complete set of minimal length parity checks. The FPM is extended to including measurement and process noise. Again a formulation is developed which only involves a singular value decomposition. The FPM is demonstrated on a model of three machine power system to indicate how it can be used as a design tool in assessing system redundancy and in determining parity checks. GRA

N82-33038# Stanford Univ., Calif. Dept. of Computer Science.
VERIFICATION OF CONCURRENT PROGRAMS. PART 2: TEMPORAL PROOF PRINCIPLES
Zohar Manna and Amir Pnueli Sep. 1981 53 p refs
(Contract N00014-76-C-0687; Grant AF-AFOSR-0014-81; AF Proj. 2304)
(AD-A116035; AFOSR-82-0495TR-Pt-2; SU-STAN-CS-81-843-Pt-2) Avail: NTIS HC A04/MF A01 CSCL 12/1

In this paper, the second of a series on the application of temporal logic to concurrent programs, we present proof methods for establishing invariance (safety) and eventuality (liveness) properties. The proof principle for establishing invariance properties is based on computational induction, and is a generalization of the inductive assertion method. For a restricted class of concurrent programs we present an algorithm for the automatic derivation of invariant assertions. In order to establish eventuality properties we present several proof principles that translate the structure of the program into basic temporal statements about its behavior. These principles can be viewed as providing the temporal semantics of the program. The basic statements thus derived are then combined into temporal proofs for the establishment of eventuality properties. GRA

N82-33039# Stanford Univ., Calif. Center for Reliable Computing.
1982 INTERNATIONAL SYMPOSIUM ON FAULT-TOLERANT COMPUTING (FTCS-12) PREPRINTS Interim Technical Report
Apr. 1982 36 p refs Symp. held at Santa Monica, Calif., 21-24 Jun. 1982
(Contracts DAAG29-82-K-0105; DAAK20-80-C-0266)
(AD-A115912; CRC-TR-82-3; CSL-TN-200; ARO-18690.1-EL) Avail: NTIS HC A03/MF A01 CSCL 12/1

Contents: Test Questions, Keynote Address; Modified Berger Codes for Detection of Unidirectional Errors; A Statistical Load Dependency Model for CPU Errors at SLAC; Self-Testing Embedded Parity Trees; Watchdog Processors and Capability Checking; and Autonomous Linear Feedback Shift Register with On-Line Fault-Detection Capability. GRA

N82-33040# CACI, Inc. - Federal, Arlington, Va.
PROGRAMMER'S MANUAL FOR THE FORECAST 90 COMPUTER PROGRAMS Final Technical Report
Richard E. Hayes 1975 85 p
(Contract DAAG39-75-C-0106)
(AD-A115829) Avail: NTIS HC A05/MF A01 CSCL 09/2

CACI, Inc., has written and placed 52 networks in computer storage at the U.S. Army War College (USAWC) as part of the Strategic Studies Institute's FORECAST 90 effort. This manual presents a brief overview of the structure and coding of the 52 FORECAST 90 networks. Programs discussed in this report

include: A Network Display Program; A Batch Mode Equivalence Search Program; An Interactive Equivalence Search Program; and A Network Summary Program. GRA

N82-33041# Command and Control Technical Center, Washington, D. C.
GENERALIZED MONITORING FACILITY. USER'S MANUAL
Barry Wallack and George H. Gero 1 May 1982 534 p
(AD-A116898; CSM-UM-246-82) Avail: NTIS HC A23/MF A01 CSCL 17/2

This Users Manual provides the information necessary for an individual to run all of the programs that are comprised in the Generalized Monitoring Facility (GMF). Program interrelationships are presented, as well as a general overview of the processing, input, and output procedures for each program. Formats and examples of user-controlled input data and sample program outputs are shown and explained. Additionally, the Job Control Language (JCL) deck setups necessary to run the programs are provided. This manual supercedes Command and Control Technical Center CSM UM 246-81, 1 May 1981. Author (GRA)

N82-33042# California Univ., Livermore. Lawrence Livermore Lab.
VECTORIZED PROCEDURAL MODELS FOR NATURAL TERRAIN: WAVES AND ISLANDS IN THE SUNSET
Nelson L. Max 1981 9 p refs Presented at the SIGGRAPH 81 Meeting, Dallas, 3-7 Aug. 1981
(Contract W-7405-eng-48)
(DE82-001697; UCRL-85110-Rev-1; CONF-810805-7-Rev-1) Avail: NTIS HC A02/MF A01

A ray-tracing procedural model is described, in which ocean waves and islands are rendered by different but related algorithms. The algorithms are based on analytic formulas involving arithmethic operations, trigonometric functions, and square roots, and are organized for a vectorizing compiler on a Cray 1, a supercomputer with a vector pipeline architecture. Height field methods are used, one vertical scan line at a time, to trace the direct rays to the ocean, where they are reflected. Approximate methods are then applied to find whether the reflected rays meet any other object on their way to the sky. The output, at eight bits per pixel, gives information for shading, e.g., the angle of the surface normal for rays meeting the islands, or the angle of elevation from the horizon for rays continuing unobstructed to the sky. The output is recorded on a magnetic tape for each frame in one cycle of the wave motion, and plotted offline on a Dicomed D-48 color film recorder. DOE

N82-33043# Edgerton, Germeshausen and Grier, Inc., San Ramon, Calif.
OMSI PASCAL-1 FOR ROM APPLICATIONS
J. E. Sander 1981 4 p refs Presented at the IEEE Symp. on Nucl. Sci., San Francisco, 21 Oct. 1981
(Contract DE-AC08-76NV-01183)
(DE82-001781; EGG-1183-4223; CONF-811012-8) Avail: NTIS HC A02/MF A01

A microcomputer-based system which executes code in read-only memory (ROM) and is written in the high level programming language PASCAL was developed for the Nuclear Test Program at the Lawrence Livermore National Laboratory. This system is a part of a network of LSI-11 microcomputers which control, monitor, and acquire data from digital measurement devices. The PASCAL language itself is a powerful and flexible tool for software engineers in the development of well-structured software than can be easily maintained. A technique for developing code in the OMSI PASCAL-1 language which will execute successfully in ROM is described. DOE

N82-33044# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
STAPP: A STATISTICAL ANALYSIS AND PLOTTING PACKAGE
Scott D. Matthews and N. Clair Smith Sep. 1981 225 p refs
(Contract DE-AC07-76ID-01570)
(DE82-001717; EGG-EA-5495) Avail: NTIS HC A10/MF A01

The statistical analysis and plotting package (STAPP) is a software system that integrates several oft-used statistical and plotting programs into one system. It functions in either a batch or ineractive environment on the Idaho National Engineering Laboratory's duel CDC Cyber 176 computer system. Statistical routines currently accessible within STAPP include: GEORGE (generalized linear regression analysis program); STEPWISE (stepwise regression program); MOCARS (a Monte Carlo simulation code); DATAPLOT (data plotting package). Also, STAPP has the capability to access statistical and mathematical library routines, such as IMSL (international mathematical and statistical library), DATAPAC (data analysis package) or a user supplied software module. Future additions to STAPP can be easily made, too. Finally, a general capability exists to enter NOS/BE or INTERCOM commands into the CDC system. DOE

N82-33045# Centro Studi ed Applicazioni in Tecnologie Avanzate, Bari (Italy).
A CRITICAL VIEW OF SOFTWARE RELIABILITY
G. Piscitelli, M. Refice, and P. Tantalo Jul. 1981 15 p refs
Avail: NTIS HC A02/MF A01

Software reliability definitions are reviewed and the impact of a proposed definition on operating systems and systems architecture is discussed. Reliability (R) of a software system (S) can be described by : 1 - RS = CS + IS - CSIS, where CS represents the probability of the occurrence of logical and coding errors (intrinsic to the given software), IS represents the probability of errors due to the interference with the external environment, and the quadratic term accounts for the fact that the previous terms may not be statistically independent of each other. This approach, associated with monoprogramming, gives the central processing unit access only to the data subspace of given software. In multiprogramming, using memory allocation partitions, access to the partitions from the outside can be prevented. The inability of von Neuman type machines to distinguish simply between data and instructions is highlighted. Author (ESA)

N82-33046# Centre Technique des Industries Mecaniques, Senlis (France).
INCLUSION OF THE COHERENT MASS AND GEOMETRICAL STIFFNESS IN CASTOR-SD [IMPLANTATION DE LA MASSE COHERENTE ET DE LA RAIDEUR GEOMETRIQUE DANS CASTOR SD]
L. VuQuoc Aug. 1981 150 p refs In FRENCH
(CETIM-11-A-201) Avail: NTIS HC A07/MF A02

The possibilities of a modal analysis, based on a coherent discretization of the potential energy and of the kinetic energy of a structure, are presented. Determination of the critical factors of a one-parameter load with reference to Euler bifurcation is considered. These techniques are available through the computer code, CASTOR-SD. Besides instability investigations, inclusion of the geometrical stiffness matrix allows for consideration of the effect of prestressing in structural modal analyses. Problem formulation is explained, in general, then specifically for elements of a bar, a beam, a plate, and for a shell. Comparison between results of test cases and those of other programs as well as with analytic results shows satisfactory agreement. Author (ESA)

N82-33047# Centre Technique des Industries Mecaniques, Senlis (France).
APPLICATION OF DYNAMIC SUBSTRUCTURING METHODS Final Report [APPLICATION DES METHODES DE SOUS-STRUCTURATION DYNAMIQUE]
Y. Ousset Feb. 1982 58 p refs In FRENCH
(CETIM-11-E-301) Avail: NTIS HC A04/MF A01

A method of substructuring, which is precise in that it introduces no additional error, is presented. Computer programming of the method with the code, CASTOR-SD, is explained. The method is compared with another structural dynamics calculation method, attributed to MacNeal. A simple example, the solution of the Helmholtz equation in a square that is divided into three subregions, is treated. Results reveal the shortcomings of the MacNeal method.

The facility with which the CASTOR-SD code accepts the dynamic substructuring method is emphasized. Author (ESA)

N82-33048# Centre Technique des Industries Mecaniques, St. Etienne (France).
OPTIMIZATION OF PROGRAMS FOR DUAL-PURPOSE EXTRUSION: USER MANUAL FOR THE FORWARD-BACKWARD EXTRUSION PROGRAM [OPTIMISATION DES PROGRAMMES DE FILAGE MIXTE. MANUEL D'UTILISATION DU PROGRAMME DE FILAGE AVANT-ARRIERE]
J. F. Renaudin Aug. 1981 33 p In FRENCH
(CETIM-1.3L-11-1) Avail: NTIS HC A03/MF A01

A user-friendly, interactive, simulation program, FILMIX, for the optimization of extruding parameters is presented. The program manual is intended for users not specialized in computer programming. Recalling FILMIX from a subroutine library is explained along with how to set up a problem. Coding of input and job parameters is demonstrated. Step by step evolution of the forming process can be displayed. Graphic representation of extrusion is shown. Results of two test cases are given. Author (ESA)

N82-33049# Stuttgart Univ. (West Germany). Inst. fuer Kernenergetik und Energiesysteme.
INVESTIGATION AND REPRESENTATION OF PROGRAM STRUCTURES [UNTERSUCHUNG UND DARSTELLUNG VON PROGRAMMSTRUKTUREN]
Helmut Reusch Apr. 1981 70 p refs In GERMAN; ENGLISH summary
(IKE-4-106; ISSN-0173-6892) Avail: NTIS HC A04/MF A01

The modules SCAN, AUST, and MAF for the documentation of program structures are presented. Module SCAN analyzes FORTRAN programs. It also stores the names of subroutines, functions and COMMON blocks, and the relations between them in the data base. Module AUST shows the sequence of called subroutines in a hierarchical structure and lists the names of subroutines, unsatisfied externals and ENTRY statements. Module MAF uses the form of a matrix to represent the structure of a program and the relations between subroutines and COMMON blocks. Author (ESA)

N82-33050# Oxford Univ. (England). Dept. of Engineering Science.
STOCHASTIC LINEAR PROGRAMMING MODELS FOR THE ECONOMIC DISPATCH OF ELECTRIC POWER
S. N. Paschentis Feb. 1982 30 p refs Sponsored by Central Electricity Generating Board
(OUEL-1396/82) Avail: NTIS HC A03/MF A01

Stochastic linear programming models based on uncertainty methods are described. The total demand forecast is considered as a random variable. The sum of the scheduled dispatch costs plus the expected recourse cost is minimized. The resulting stochastic program is first transformed into a nonlinear deterministic equivalent program, and then solved by applying piecewise linearization techniques and using the standard Simplex algorithm. Penalty costs for under and over-scheduling in the recourse cost, and factors to account for negative costs frequency stability initial conditions and unit commitment changes are considered in the model. Author (ESA)

N82-33051# Oxford Univ. (England). Dept. of Engineering.
IDENTIFICATION PACKAGE FOR VAX/VMS
D. W. Clarke 1982 65 p refs
(OUEL-1403/82) Avail: NTIS HC A04/MF A01

A set of related FORTRAN programs produces best estimates of the parameters of linear transfer functions on the basis of experimentally obtained input-output data records such that the models fit the data in an optimal way, is described. Diagnostic programs, which indicate the validity of the estimated models, and graphical data-display programs, which provide engineering insight into the identification process, are included. The transform function models obtained are of a discrete-time z-transform structure, z being the forward shift operator. Author (ESA)

N82-33052# Centre Technique des Industries Mecaniques, St. Etienne (France).
OPTIMIZATION OF PROGRAMS FOR HYBRID EXTRUDING. USER MANUEL: PROGRAM FOR DOUBLE BACKWARD EXTRUDING [OPTIMISATION DES PROGRAMMES DE FILAGE MIXTE - MANUEL D'UTILISATION DU PROGRAMME DE FILAGE DOUBLE-ARRIERE]
J. F. Renaudin 28 Jan. 1982 33 p In FRENCH
(CETIM-1.3L-11-1) Avail: NTIS HC A03/MF A01

A user friendly, interactive, numerical simulation program for the optimization of tooling parameters with reference to extruding is presented. Recalling the program from a subroutine library is described. Program capabilities are discussed and setting up a problem is explained. Parameterization on a remote terminal is treated step by step. Graphic representation of the extrusion process is depicted. Two test cases demonstrate the technique. Author (ESA)

N82-33053# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. d'Informatique.
APPROXIMATION OF A FUNCTION OF TWO-VARIABLE FINITE ELEMENTS: GRAPHIC REPRESENTATION. APPLICATION TO CARDIOGRAPHY [APPROXIATION D'UNE FONCTION DE DEUX VARIABLES. REPRESENTATION GRAPHIQUE. APPLICATION A LA CARTOGRAPHIE CARDIAQUE]
Christine Potier and Christine Vercken Oct. 1981 35 p refs In FRENCH Presented at Colloq. sur les Methodes Math. de la Geograph., Besancon, France, Oct. 1981
(ENST-C-81010) Avail: NTIS HC A03/MF A01

The construction of a triangulation mesh with good properties (computational simplicity and numerical stability) is explained along with polynomial approximation of a function on each triangle. Interpolation by a linear family of equations is discussed. The particular case of the tensor product is covered. Triangular finite element methods in R2 are introduced, including triangulation of a domain in R2. Linear interpolation of a finite element is treated. The Argyris finite element, Hshieh-Clough-Tocher finite elements, and the Powell finite element are studied. Application of the mathematics to electroepicardiography is presented. Computer programs for data processing and image construction are outlined. Test representations are shown and evaluated. Author (ESA)

N82-33054# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
HONEYWELL INFORMATION SYSTEMS COBOL CB4.1U3 B03 Validation Summary Report
31 Oct. 1981 66 p 4 Vol.
(PB82-155441; FCTC-81-113-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Honeywell Information Systems COBOL CB4.1U3 B03 running under the B01 operating system, provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-33055# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
HONEYWELL INFORMATION SYSTEMS COBOL, VERSION 5.0 Validation Summary Report
31 Oct. 1981 70 p 4 Vol.
(PB82-155417; FCTC-81-112) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Honeywell Information Systems COBOL Version 5.0 running under the MR9.0 operating system, provides a consolidated summary of the results

obtained from the validation of the subject computer against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the HIGH level of FIPS PUB 21-1. The VSR is made up of several sections showing at the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-33056# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
HONEYWELL INFORMATION SYSTEMS FORTRAN FZ1.0 Validation Summary Report
31 Oct. 1981 16 p 4 Vol.
(PB82-155425; FCTC-81-115-Vol-4) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Honeywell Information Systems FORTRAN 77 B01 running under the CP-6 B01 operating system, provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-33057# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
HONEYWELL INFORMATION SYSTEMS FORTRAN F21.0 Validation Summary Report
31 Oct. 1981 13 p 4 Vol.
(PB82-155433; FCTC-81-114-Vol-3) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Honeywell Information Systems FORTRAN FZ1.0 running under the SR 4J83 - DPS1.3 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 FORTRAN Standard (X3.9-178/FIPS PUB69). The compiler was validated against the Subset level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-33058# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
HARRIS CORPORATION HARRIS S-800 HARRIS COBOL VERSION 10.0.0
12 Nov. 1981 53 p
(PB82-164179; FCTC-81-117) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Harris 800 COBOL Version 10.0.0 running under the Vulcan 09A operating system provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the Low-Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-33059# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
HARRIS CORPORATION HARRIS 800 FORTRAN 77 VERSION 9.2 (NON-SAU)
12 Nov. 1981 12 p
(PB82-164229; FCTC-81-143) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Harris 800 FORTRAN Version 9.2 (Non-Sau) running under the Vulcan 09A operating system, provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Subset level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-33060# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
HARRIS CORPORATION HARRIS 800 FORTRAN 77 VERSION 9.2 (SAU)
12 Nov. 1981 12 p
(PB82-164187; FCTC-81-118) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Harris 800 FORTRAN Version 9.2 (Sau) running under the Vulcan 09A operating system, provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 FORTRAN Standard (X3.9-1978/FIPS PB 69). The compiler was validated against the Subset level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N82-33061# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
INTERNATIONAL BUSINESS MACHINES CORPORATION, IBM SERIES/1 COBOL 5719-CB5 VERSION 2 LEVEL 0 (COBOL TECHNICAL REPORT)
31 Aug. 1981 14 p
(PB82-155409; FCTC-81-31) Avail: NTIS HC A02/MF A01 CSCL 09B

This FCTC Technical Report for the Indexed I-O Level 1 and Sort-Merge Level 1 modules of the IBM Series/1 5719-CB5 COBOL Compiler Version 2 Level 0 running under the Event Driven Executive (EDS) Version 3 Level 1, provides a consolidated summary of the results obtained from the evaluation of the subject compiler against the Indexed I-O Level 1 and Sort-Merge Level 1 modules of the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). This technical report is made up of several sections showing all the discrepancies found - if any. GRA

N82-32543*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DSN DATA SYSTEMS SOFTWARE METHODOLOGY
C. K. Hung *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 132-143 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 09B

N82-32548*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TOP DOWN IMPLEMENTATION PLAN FOR SYSTEM PERFORMANCE TEST SOFTWARE
G. N. Jacobson and A. Spinak *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 190-199 (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 01B

62 COMPUTER SYSTEMS

Includes computer networks.

N82-33062*# Santa Clara Univ., Calif. Dept. of Electrical Engineering.
CHANNEL CODING IN THE SPACE STATION DATA SYSTEM

NETWORK
Tim Healy May 1982 54 p refs
(Contract NCC2-128)
(NASA-CR-166402; NAS 1.26:166402) Avail: NTIS HC A04/MF A01 CSCL 09B

A detailed discussion of the use of channel coding for error correction, privacy/secrecy, channel separation, and synchronization is presented. Channel coding, in one form or another, is an established and common element in data systems. No analysis and design of a major new system would fail to consider ways in which channel coding could make the system more effective. The presence of channel coding on TDRS, Shuttle, the Advanced Communication Technology Satellite Program system, the JSC-proposed Space Operations Center, and the proposed 30/20 GHz Satellite Communication System strongly support the requirement for the utilization of coding for the communications channel. The designers of the space station data system have to consider the use of channel coding. Author

N82-33063 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
A REVISED DEFINITION OF A SOURCE COMMUNICATION PROTOCOL AND ITS IMPLEMENTATION
B. J. Chorley and G. I. Parkin Apr. 1982 53 p refs
(NPL-DITC-5/82) Copyright. Avail: Issuing Activity

An information transfer protocol, whereby two parties can negotiate encryption method, initialization values and a key source, through the network, is presented. The protocol includes document signature and key supply from an independent network security center as a service on the network. It can accommodate encryption methods as they are developed. An implementation of the protocol as a layer above the Level-3 of the X-25 protocol is described. Author (ESA)

N82-33064# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PRELIMINARY DESIGN OF A COMPUTER COMMUNICATIONS NETWORK INTERFACE USING INTEL 8086 AND 8089 16-MICROPROCESSORS M.S. Thesis
Andrew G. Gravin Dec. 1981 107 p refs
(AD-A115639; AFIT/GCS/EE/81D-9) Avail: NTIS HC A06/MF A01 CSCL 17/2

This research describes the design of a Universal Network Interface Device (UNID II) which is intended for use in a computer communications network. The II distinguishes UNID II from the original UNID which was also designed and developed at the Air Force Institute of Technology. UNID II's purpose is to lessen the time delays and development costs incurred by custom-designing network interfaces for each application. UNID II is a programmable interface; and although different applications require different device dependent programming, UNID II hardware remains essentially unchanged. A requirements study shows that to handle a wide variety of interfacing situations, UNID II must perform node functions which include concentration, switching and routing, front-end processing, and user-terminal interfacing. The performance of these functions relieves network hosts from communication-specific software. The key design concept is the subdivision of UNID II into two independent subsystems which communicate through an area in shared memory. GRA

N82-33065# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DEVELOPMENT OF THE DIGITAL ENGINEERING LABORATORY COMPUTER NETWORK: HOST-TO-NODE/HOST-TO-HOST PROTOCOLS M.S. Thesis
John W. Geist Dec. 1981 217 p refs
(AD-A115613; AFIT/GCS/EE/81D-8) Avail: NTIS HC A10/MF A01 CSCL 09/2

Development of the Air Force Institute of Technology Digital Engineering Laboratory's local computer network (DELNET) was continued with requirements formulation, environment evaluation, organization and structure design, network node software implementation, and host software design. System requirements were evaluated from an implementor's viewpoint. System organization and protocol structure emphasized the International Standards Organization's Reference Model of Open Systems Interconnection protocol standard. A locally developed network node, the Universal Network Interface Device (UNID), was advanced and confirmed as operative. Methodology was established for targeting node operating system software, packages consisting of both high order language Zilog PLZ/SYS and assembly modules, to the UNID. An initial node software package was organized and implemented. The study continued wth an evaluation of the host computer environment, applicable host requirements, and a map of the ISO protocol model on the DELNET topology. ISO model layers were defined for the DELNET, and design alternatives were suggested. GRA

N82-33066# CACI, Inc. - Federal, Arlington, Va.
A GUIDE TO NETWORK CONSTRUCTION AND UTILIZATION Final Technical Report
Richard E. Hayes 1975 187 p refs
(Contract DAAG39-75-C-0106)
(AD-A115831) Avail: NTIS HC A09/MF A01 CSCL 09/2

The FORECAST 90 contract effort was designed to test a concept originated by the Strategic Studies Institute (SSI) for linking long-range planning requirements to forecasting techniques. The heart of the approach lies in combining trend projection techniques and conflict analysis techniques into a networking system in order to make the risks and opportunities inherent in various decision alternatives visible to the decision-maker. This contract phase focused on two aspects of the overall FORECAST 90 effort: (1) methodological development of a system capable of producing and integrating a variety of plausible futures and displaying them in a form readily understandable and usable to Army planners, and (2) demonstration of the utility of that system by producing an initial set of futures, integrating them, and demonstrating a computer-based system for storing, retrieving, and monitoring the forecasting system. GRA

N82-33067# Connecticut Univ., Storrs. Lab. for Computer Science Research.
MODELS AND MEASUREMENTS OF PARALLELISM FOR A DISTRIBUTED COMPUTER SYSTEM M.S. Thesis
Debra S. Lane 1982 81 p refs
(Contract DASG60-79-C-0117)
(AD-A116762; TR-CS-82-1) Avail: NTIS HC A05/MF A01 CSCL 09/2

This thesis performed two tasks: the formulation of a model of parallelism for a distributed computer system, and the instrumentation of that system to validate the model. The model of parallelism is a Markov process, where the states of the model correspond to the states of the system. A model exists for two and three processors. The two processor model has four states and the three processor model has eight states. It has been determined that a four processor model would have nineteen states and a five processor model, twenty-nine states. These models were not formulated due to the large number of states and the results of validating the two and three processor models indicated that not much information could be gained from them. Validation of the two and three processor models revealed that they weren't very accurate. The relative error was 20% and less for two processors and 30% and less (with the exception of one state whose error was 55%) for three processors. GRA

N82-33068# Fondazione Ugo Bordoni, Rome (Italy).
STANDARDS ASPECTS OF THE TRANSPORT LEVEL IN THE OSI MODEL ARCHITECTURE FOR DISTRIBUTED NETWORKS [ASPETTI DELLA NORMATIVA DEL LIVELLO DI TRASPORTO NELL'AMBITO DELL'ARCHITETTURA OSI DI RETE DISTRIBUITA]
Antonio Cassese and Achille Pattavina Apr. 1982 30 p refs In ITALIAN
(FUB-8-1982; RIF-2B0882) Avail: NTIS HC A03/MF A01

The status of the standardization of the transport level of the OSI model is discussed. The role played in the architecture of a

distributed network is pointed out. The latest results of the ISO are analyzed, noting the importance given to the description of transport protocols. The basic requirements of the transport services, individuated by CCITT and ISO norms are detailed. The classes of transport protocols are defined and discussed. Given the multiplicity of network technologies, it is concluded that the levels of transport are indispensable tools in distributed networks. Author (ESA)

N82-33069# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. d'Informatique.
LOW LEVEL COMMUNICATION PROTOCOLS IN LOCAL NETWORKS Ph.D. Thesis - Paris Univ.-Sud [PROTOCOLES DE COMMUNICATION DE BAS NIVEAU ET RESEAUX LOCAUX]
Eric Horlait Nov. 1981 119 p refs In FRENCH
(ENST-E-81005) Avail: NTIS HC A06/MF A01

Access techniques in local area computer networks were studied using queueing theory models. A random access algorithm for packet-switching random transmission systems is described and application examples which show that the system parameters can be determined from the external traffic characteristics are given. The simulation program used in channel performance evaluation is included. The experimental assembly of a computer network using optical fibers and random access protocol is described. It is shown that the experimental network is useful for protocol performance evaluation. An assigned slot listen before transmission protocol algorithm is compared to the random access algorithm. Disadvantages of the deterministic methods are pointed out. Experimental implementation of a multilevel computer network, using a Z-80 microprocessor as a compressing dovice is described. Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N82-33070# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
DEVELOPMENT OF AN ALGORITHM FOR REAL TIME CONTROL OF A SATELLITE TRACKING SYSTEM
Valcir Orlando and Octavio Maizza Neto May 1982 8 p refs Presented at the 13th Intern. Symp. on Space Technol. and Sci., Tokyo, 27 Jun. - 3 Jul. 1982
(INPE-2421-PRE/128) Avail: NTIS HC A02/MF A01

A numerical algorithm is developed for optimal position alignment real time control of a satellite tracking antenna. The tracking system presents a linear plant with a separated saturation type nonlinearity. Optimal control techniques are applied to the linear plant using the nonlinearity as input. The achieved control values are obtained by inversion of the nonlinearity function and constrained to satisfy the limits imposed by the saturation. Optimization is taken in intervals of time correspondent to fixed and predetermined number of sample periods. For each control channel, estimates of the correspondent reference angle are needed only at the end of each interval, and for the state the estimates are only needed at the beginning of these intervals. State transition matrix is used to propagate the state inside these intervals, strengthening the characteristic of application in real time by allowing the anticipated calculation of the control signals inside the optimization intervals. To test the procedure, a numerical simulation of tracking of a low altitude satellite orbit by a 30 foot antenna tracking system was considered. S.L.

N82-33071# Massachusetts Univ., Amherst.
STRATEGIES FOR KNOWLEDGE-BASES IMAGE INTERPRETATION Interim Report
May 1982 39 p refs
(Contract N00014-75-C-0459; Grant NSF MCS-79-18209)
(AD-A115914; COINS-TR-82-10) Avail: NTIS HC A03/MF A01 CSCL 09/4

Strategies suggested by general observations can be used to control processing in a knowledge-based image interpretation system. Several strategies are discussed and experiments are presented to illustrate their use. Author (GRA)

N82-33072# Brown Univ., Providence, R. I. Center for Dynamical Systems.
OPTIMAL CONTROL AND NONLINEAR FILTERING FOR NONDEGENERATE DIFFUSION PROCESSES
Wendell H. Fleming and Sanjoy K. Mitter (MIT) Sep. 1981 24 p refs
(Contract ET-76-A-012295; Grants NSF MCS-79-03554; AF-AFOSR-0166-81; AF-AFOSR-3281-77; AF Proj. 2304)
(AD-A117069; LCDS-82-9; AFOSR-82-0569TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A linear parabolic partial differential equation describing the pathwise filter for a nondegenerate diffusion is changed, by an expotential substitution, into the dynamic programming equation of an optimal stochastic control problem. This substitution is applied to obtain results about the rate of decay as the numerical value of chi approaches infinity of solutions p(chi, tau) to the pathwise filter equation, and for solutions of the corresponding Zakai equation. GRA

N82-33073*# Brown Univ., Providence, R. I. Center for Dynamical Systems.
DISTRIBUTED SYSTEM OPTIMAL CONTROL AND PARAMETER ESTIMATION: COMPUTATIONAL TECHNIQUES USING SPLINE APPROXIMATIONS Interim Report
H. T. Banks Apr. 1982 12 p refs Presented at the 3rd IFAC Symp. on Control of Distributed Parameter Systems, Toulouse, 29 Jun. - 2 Jul. 1982
(Contracts NAS1-15810; NAS1-16394; DAAG29-79-C-0161; Grants AF-AFOSR-0198-81; NSF MCS-79-05774; AF Proj. 2304)
(NASA-CR-169224; NAS 1.26:169224; AD-A117066; LCDS-82-6; AFOSR-82-0513TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Spline-based computational procedures for parameter estimation and optimal control problems involving delay and partial differential equations are outlined. Brief discussions are presented reporting on application of the ideas to compute feedback controls for delay systems, to estimate variable coefficients in population dispersal models, and to estimate parameters in higher order models arising in elasticity. Author (GRA)

N82-33074# Engins Matra, Velizy (France).
SURVEY OF THE STATE OF THE ART IN ROBOTICS AND ARTIFICIAL INTELLIGENCE. VOLUME 1: EXECUTIVE SUMMARY Final Report
Gerard Berger, Robert Havas, and Roland Prajoux Paris ESA Aug. 1981 113 p refs Prepared in cooperation with Laas, Toulouse 3 Vol.
(Contract ESTEC-4504/80/NL-PP)
(Rept-0361/DX60-Vol-1; ESA-CR(P)-1552-Vol-1) Avail: NTIS HC A06/MF A01

Trends and techniques in robotics and artificial intelligence were surveyed in order to assess their space applicability and to identify areas which can be developed/adapted to European space programs. Increases in mission efficiency which these techniques produce are discussed. Onboard data processing, high level programming languages, and hardware are treated. Artificial intelligence techniques already suitable for space use include software design tools, and information retrieval systems. Robot control techniques are also suitable, but robot systems hardward must be developed for assembly or maintenance activities. Implementation of robotics and artificial intelligence favors hierarchically structured, decentralized systems. Author (ESA)

N82-33075# Engins Matra, Velizy (France).
SURVEY OF THE STATE OF THE ART IN ROBOTICS AND ARTIFICIAL INTELLIGENCE. VOLUME 2: TECHNICAL REPORT Final Report
Gerard Berger, Robert Havas, and Roland Prajoux Paris ESA

Aug. 1981 353 p Prepared in cooperation with Laas, Toulouse 3 Vol.
(Contract ESTEC-4504/80/NL-PP)
(Rept-0362/DX60-Vol-2; ESA-CR(P)-1552-Vol-2) Avail: NTIS HC A16/MF A01

Trends and techniques in robotics and artificial intelligence were surveyed in order to assess their space applicability and to identify areas which can be developed/adapted to European space programs. Increases in mission efficiency which these techniques produce are discussed. Onboard data processing, high level programming languages, and hardware are treated. Artificial intelligence techniques already suitable for space use include software design tools, and information retrieval systems. Robot control techniques are also suitable, but robot systems hardware must be developed for assembly or maintenance activities. Implementation of robotics and artificial intelligence favors hierarchically structured, decentralized systems. Author (ESA)

N82-33076# Engins Matra, Velizy (France).
SURVEY OF THE STATE OF THE ART IN ROBOTICS AND ARTIFICIAL INTELLIGENCE. VOLUME 3: APPENDICES AND BIBLIOGRAPHY Final Report
Gerard Berger, Robert Havas, and Roland Prajoux Paris ESA Aug. 1981 131 p refs Prepared in cooperation with Laas, Toulouse 3 Vol.
(Contract ESTEC-4504/80/NL-PP)
(Rept-0363/DX60-Vol-3; ESA-CR(P)-1552-Vol-3) Copyright. Avail: NTIS HC A07/MF A01

A subject index, annotated bibliography (over 300 items), and glossary for ESA report 'Survey of the state of the art in robotics and artificial intelligence' are presented. Author (ESA)

N82-33077# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
UNIFORM RATES OF CONVERGENCE FOR TWO k-SERVER QUEUES
Hermann Thorisson 1982 29 p ref
(CTH-Math-1982-3) Avail: NTIS HC A03/MF A01

Moments are established for the busy cycle (and the delay) in the G/G/k queueing system under conditions on the service and interarrival distributions (and on the initial conditions). Together with general results on coupling of regenerative processes, moment results yield uniform rates of convergence for the stochastic process z sub t = the queue length and the remaining service times at time, t, and the time from t until next arrival after t. Analogous results are obtained for the k-server queueing system with nontime-homogeneous Poisson arrivals and variable service times. Author (ESA)

N82-33078# Sheffield Univ. (England). Dept. of Control Engineering.
COMPUTATION OF THE ZEROS AND ZERO-DIRECTIONS OF LINEAR MULTIVARIABLE SYSTEMS
O. M. E. El-Ghezawi, A. S. I. Zinober, D. H. Owens, and S. A. Billings Feb. 1982 16 p refs
(RR-164) Avail: NTIS HC A02/MF A01

A geometric method for the calculation of system zeros and zero-directions for the system S(A,B,C) with an equal number of inputs and outputs for both the cases of CB singular and non-singular is presented. The method is based on a particular choice of state feedback control law motivated by variable structure systems in the sliding mode. Zeros are determined by finding a subset of the eigenvalues of an nth order matrix, or by calculating the eigenvalues of an (n-m)th order matrix. State and input zero-directions can be calculated independently of each other without resorting to the determination of the null space of the (n+m)th order system matrix. Author (ESA)

N82-33079# Sheffield Univ. (England). Dept. of Control Engineering.
ROBUST CONTROL DESIGN FOR UNCERTAIN DYNAMIC SYSTEMS USING APPROXIMATE MODELS. PART 2: THE MULTIVARIABLE CASE
D. H. Owens and A. Chotai Feb. 1982 37 p refs
(Grant SERC-GR/B/23250)
(RR-164-Pt-2) Avail: NTIS HC A03/MF A01

The degree of uncertainty to be expected in multivariable feedback design studies due to observed differences in plant and model open-loop transient behavior is discussed. Frequency domain design techniques are extended in order to quantify this uncertainty such that closed-loop stability and tracking of step demands are guaranteed. Functional analytic methods in partially ordered Banach space are then used to provide easily computed graphical estimates of the error involved in prediction of closed-loop transient performance. A detailed model of plant dynamics is not needed at any point in the design, all calculations being based upon graphical analyses of plant step response data deduced from plant trials or complex model simulations. Author (ESA)

N82-33080# Sheffield Univ. (England). Dept. of Control Engineering.
OPTIMAL CONTROL OF LINEAR DIFFERENTIAL MULTIPASS PROCESSES
I. Willson, W. D. Collins, and D. H. Owens Mar. 1982 38 p refs
(RR-173) Avail: NTIS HC A03/MF A01

A feedback controller for a multipass process, involving a fixed finite number of passes, is synthesized. The controller brings the system close to a desired terminal condition. The synthesis minimizes a quadratic performance index, consisting of quadratic terminal state terms, added to an integral of quadratic intermediate state forms, plus control for each pass. A noncausal linear feedback controller is derived, and the existence of causal linear feedback controllers is demonstrated. Conditions satisfied by these controllers are discussed, and computational and implementation aspects are outlined. Author (ESA)

N82-33081# Sheffield Univ. (England). Dept. of Control Engineering.
THE ROLE OF SIMPLE TECHNIQUES IN MODEL ORDER REDUCTION BACKED BY FAST INTERACTIVE SIMULATION TO VERIFY MODEL ACCURACY
A. S. Morris 1982 24 p refs
(RR-175) Avail: NTIS HC A02/MF A01

The role of model order reduction techniques which rely solely on neglecting relatively large system poles is examined. The advent of fast, simple to use, interactive simulation languages makes this simple method attractive as a first try. The good results which simple techniques can achieve are shown by application to a 10th order model of an electric arc furnace electrode position controller. This is reduced to a sixth order model by the simple technique, and also by a mathematically rigorous plane-projection method. Comparison of the resulting models shows that the one produced simply is just as good as, and avoids the mathematical complexity of, other techniques. Author (ESA)

N82-33082# Oxford Univ. (England). Dept. of Engineering Science.
STATE INEQUALITIES APPROACH TO CONTROL SYSTEMS WITH UNCERTAINTY
A. Swierniak (Silesian Technical Univ.) 1982 13 p refs Sponsored by British Council
(OUEL-1401/82) Avail: NTIS HC A02/MF A01

Discrete time system models in which state inequalities are used to introduce the approximation errors are discussed. If the basic model is used to find a control law minimizing a performance criterion, the extended model may be used to determine how the basic model will deteriorate because of the model error. Calculus of variations and sensitivity analysis are used. The extended model may be considered the point-to-set map for which the basis model is the selector. The results are particularly simple in linear-quadratic problems. Author (ESA)

N82-33083# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
A NONCONSTRUCTIVE UPPER BOUND ON COVERING RADIUS

Gerard D. Cohen 1982 8 p refs Presented at IEEE Symp. on Inform. Theory, Les Arcs, France, Jun. 1982
(ENST-C-82001) Avail: NTIS HC A02/MF A01

The determination of rho (C) is considered. Let C be an (n,k) code, i.e., a binary linear k-dimensional vector space, and denote rho (C) its covering radius. Let t(n,k) denote the minimum covering radius of the binary linear (n,k) code. A nonconstructive upper bound on t(n,k) which coincides asymptotically with the known lower bound, namely 1/N## t(n,nR) = 1/H## (1-R) + 0 (1/N## log n), where R is fixed, 0 < R < 1, and 1/H is the inverse of the binary entropy function, is given. Author (ESA)

N82-33084# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
ON FUZZY RELATIONS AND PARTITIONS
Bernadette Bouchon (CNRS, Paris) and Gerard D. Cohen Nov. 1981 12 p refs Submitted for publication
(ENST-C-81009) Avail: NTIS HC A02/MF A01

Fuzzy binary relations, R, defined on a finite set, E, and associated with a distance relation, d = 1-R, are studied. Metrical properties dealing with spheres and cliques in E are given and used to construct partitions of E. The membership functions are assumed to take values in a finite set. Combinatorial results for the number of fuzzy relations and partitions are derived, generalizing classical enumeration coefficients. Author (ESA)

N82-33085# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
NONSYNCHRONIZING SEQUENCES IN CONVOLUTIONAL CODES (N, 1) [SUITES NON SYNCHRONISANTES DES CODES CONVOLUTIONNELS (N, 1)]
Philippe Godlewski and Marc Mouffron Oct. 1981 15 p refs In FRENCH; ENGLISH summary
(ENST-D-81007) Avail: NTIS HC A02/MF A01

The problem of symbol synchronization in decoding convolutional is considered. The notion of nonsynchronizing sequence (NSS) is defined. The case of codes with parameters N, K = 1 is studied. Such sequences do not always exist. However, for any binary code with parameters N = 2, K = 1, an NSS of period less than 2 to the (2 NU + 1) power, where NU is the length constraint on coding, is possible. Theory (polynomials; formal series; multiplexing; coding) is developed. The concept of compact form is introduced which allows for the characterization of the coder-multiplexer system by K polynomials. In the case of (N, 1) codes, NSS are discussed. Results show that they are necessarily periodic. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N82-33086# Analytic Sciences Corp., Reading, Mass.
RESEARCH IN MULTIRATE ESTIMATION AND CONTROL. OPTIMAL SAMPLE RATE SELECTION Report, 1 May 1979 - 1 May 1980
Douglas P. Glasson Oct. 1981 66 p refs
(Contract N00014-79-C-0431)
(TR-1356-2) Avail: NTIS HC A04/MF A01

An algorithmic methodology for sample rate selection in multirate digital control design is developed. The methodology is based on optimizing the random disturbance rejection properties of a closed-loop multirate control structure under a computational constraint. The formulation and mathematical development of the multirate control design and sample rate selection procedure are presented; the sample data selection technique and properties of the resulting controllers are demonstrated through aircraft control examples. M.G.

N82-33087# National Oceanic and Atmospheric Administration, Washington, D. C.
A RECURSIVE APPROACH WHICH ILLUSTRATES THE CONNECTION BETWEEN A CUBIC SPLINE AND THE DATA IT FITS
Jerry Sullivan Oct. 1981 24 p refs
(NOAA-TM-EDIS-30) Avail: NTIS HC A02/MF A01

A way to view the ordinary cubic spline, which is the mathematical analog to an elastic ruler or beam, is offered. The cubic spline is frequently used when a smooth curve has to be fitted through a discrete data set. The spline consists of many individual cubics that are joined together smoothly. The ordinary cubic spline passes through all of the data and usually does not produce unwanted oscillations in the intervals between data. The idea behind the spline is clear and the smoothness and exact-fit mathematical requirements can also be stated clearly. However, when the resulting equations are solved by matrix methods, the relation between the cubics and the data they fit is obscure. By solving the equations using an alternate technique, the recursion method, the connection are evenly spaced along one axis, the relationship becomes especially clear. Illustrating the relation is the main point of this article. Author

N82-33088*# Wisconsin Univ., Madison. Dept. of Statistics.
VECTOR SPLINES ON THE SPHERE WITH APPLICATION TO THE ESTIMATION OF VORTICITY AND DIVERGENCE FROM DISCRETE, NOISY DATA Scientific Interim Report
Grace Wahba May 1982 25 p refs
(Grant NAG5-128; Contract N00014-77-G-0675)
(NASA-CR-169221; NAS 1.26:169221; TR-674) Avail: NTIS HC A02/MF A01 CSCL 12A

Vector smoothing splines on the sphere are defined. Theoretical properties are briefly alluded to. The appropriate Hilbert space norms used in a specific meteorological application are described and justified via a duality theorem. Numerical procedures for computing the splines as well as the cross validation estimate of two smoothing parameters are given. A Monte Carlo study is described which suggests the accuracy with which upper air vorticity and divergence can be estimated using measured wind vectors from the North American radiosonde network. S.L.

N82-33089*# Systems and Applied Sciences Corp., Hampton, Va.
DOCUMENTATION OF PROGRAM AFTBDY TO GENERATE COORDINATE SYSTEM FOR 3D AFTER BODY USING BODY FITTED CURVILINEAR COORDINATES, PART 1
Dilip Kumar Jun. 1980 78 p refs
(Contract NAS1-15604)
(NASA-CR-159278; NAS 1.26:159278; R-SAL-06/80-02-Pt-1) Avail: NTIS HC A05/MF A01 CSCL 12A

The computer program AFTBDY generates a body fitted curvilinear coordinate system for a wedge curved after body. This wedge curved after body is being used in an experimental program. The coordinate system generated by AFTBDY is used to solve 3D compressible N.S. equations. The coordinate system in the physical plane is a cartesian x,y,z system, whereas, in the transformed plane a rectangular xi, eta, zeta system is used. The coordinate system generated is such that in the transformed plane coordinate spacing in the xi, eta, zeta direction is constant and equal to unity. The physical plane coordinate lines in the different regions are clustered heavily or sparsely depending on the regions where physical quantities to be solved for by the N.S. equations have high or low gradients. The coordinate distribution in the physical plane is such that x stays constant in eta and zeta direction, whereas, z stays constant in xi and eta direction. The desired distribution in x and z is input to the program. Consequently, only the y-coordinate is solved for by the program AFTBDY. S.L.

N82-33090# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
COMPUTATIONAL COMPLEXITY OF THE CAPACITATED LOT SIZE PROBLEM
Gabriel R. Bitran (MIT, Cambridge) and Horacio H. Yanasse Apr. 1982 28 p refs
(INPE-2382-RPE/410; WP1271-81) Avail: NTIS

HC A01/MF A01

The computational complexity of the capacitated lot size problem with a particular cost structure that is likely to be used in practical settings is studied. For the single item case new properties are introduced, classes of problems solvable by polynomial time algorithms are identified, and efficient solution procedures are given. It is shown that special classes are NP-hard, and that the problem with two items and independent setups in NP-hard under conditions similar to those where the single item problem is easy. Topics for further research are discussed in the last section.

Author

N82-33091# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

EXACT INVERSE SCATTERING SOLUTION OF A NONLINEAR EVOLUTION EQUATION IN NONUNIFORM MEDIA

J. J. deCastro and J. P. Sudano (Inst. of Tech. de Aeronautica) Jun. 1982 11 p refs Submitted for publication

(INPE-2425-PRE/131) Avail: NTIS HC A02/MF A01

The inverse scattering method is applied to obtain analytic soluton of the nonlinear Schroedinger equation in nonuniform media. It is shown that an exact solution exists for a parabolically inhomogeneous medium, provided a dissipative term is present in the nonlinear evolution equation.

Author

N82-33092# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Numerical Analysis and Computing Science.

ON THE CONTROL OF THE GLOBAL ERROR IN STIFF INITIAL VALUE PROBLEMS

Germund Dahlquist 1981 13 p refs Presented at Dundee Conf. on Numerical Anal., 1981 Submitted for publication

(TRITA-NA-8109) Avail: NTIS HC A02/MF A01

Characterizations of optimal step size sequences for methods for the solution of stiff differential equations are considered. An approach to the estimation and control or a norm of the global error is modified and applied to systems of stiff ordinary differential equations in partitioned form. Results show that in typical stiff problems the global error should be kept at the maximum level during large intervals. Before it reaches that level, a quantity, described as the discounted value of the local truncation error per step, should be kept constant. To obtain the value of this constant requires forecasting. With the given control strategy, the global error tends more slowly to its maximum level. An estimate of the local rate of decay (growth) of the previously committed errors is needed. The scheme works well on dissipative problems. The suggestions are more tentative for nondissipative problems and for problems where the growth rate is increasing.

Author (ESA)

N82-33093# Wisconsin Univ., Madison. Mathematics Research Center.

COMPARISON THEOREMS FOR REACTION-DIFFUSION SYSTEMS DEFINED IN A UNBOUNDED DOMAIN Technical Summary Report

David Terman Apr. 1982 15 p refs

(Contract DAAG29-80-C-0041; Grant NSF MCS-80-17158)

(AD-A116186; MRC-TSR-2374) Avail: NTIS HC A02/MF A01 CSCL 12/1

Comparison theorem techniques have played a central role in the study of scalar, nonlinear, parabolic differential equations. These techniques have proven less successful in the study of systems of equations for several reasons. Usually a very strong monotonicity condition must be imposed on the nonlinear terms of the equations. This severely restricts the applicability of the comparison theorems. Furthermore, there are technical difficulties associated with unbounded domains for systems of equations which are not present for scalar equations. In this report we demonstrate how these difficulties can be overcome for certain systems of reaction-diffusion equations. These systems have numerous applications including nerve conduction and mathematical ecology.

Author (GRA)

N82-33094# Pittsburg Univ., Pa. Inst. for Computational Mathematics and Applications.

SOME ANALYTIC TECHNIQUES FOR PARAMETRIZED NONLINEAR EQUATIONS AND THEIR DISCRETIZATIONS

James P. Fink and Werner C. Rheinboldt Jun. 1982 17 p refs (Contract N00014-80-C-0455; Grant AF-AFOSR-0176-80)

(AD-A116410; ICMA-82-39) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper presents general techniques based on the theory of Fredholm operators for analyzing the solutions of parametrized nonlinear equations and their finite-dimensional approximations. In particular, it is shown how to obtain the existence of solution paths, both for a general class of nonlinear equations and for their discretizations, and to develop error estimates. Finally it is also shown that the results include existing results for mildly nonlinear problems.

Author (GRA)

N82-33095# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

MACHINE SEGMENTATION OF UNFORMATTED CHARACTERS M.S. Thesis

Robin A. Simmons Dec. 1981 117 p refs

(AD-A115556; AFIT/GE/EE/81D-54) Avail: NTIS HC A06/MF A01 CSCL 09/2

A method of segmenting unformatted alpha-numeric characters is presented. Reconstructing the magnitude of the Fourier transform of a template character with the phase of a string of unformatted characters containing the template character causes all characters that do not have the magnitude of the template to be attenuated in the visual domain. The template character will not be attenuated, since it has both proper magnitude and phase, and a peak detector can find the most probable location of the character. This process also gives a first choice for what the character is (the template). Results are presented for most of the English alphabet.

M.G.

N82-33096# Research Inst. of Colorado, Fort Collins.

NUMERICAL SOLUTION OF THE THREE-DIMENSIONAL NAVIER-STOKES EQUATION Final Report

James W. Thomas Mar. 1982 13 p refs

(Contract F49620-80-C-0075; AF Proj. 2304)

(AD-A116084; RIC-64; AFOSR-82-0486TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

A three-dimensional version of the Beam-Warming scheme for solving the compressible Navier-Stokes equations was implemented on the Cray-1 computer. The scheme is implicit and second-order accurate. The code is totally vectorized, allows for complicated geometries and includes a thin layer turbulence model. Timings and comparisons are given. A preliminary discussion of the full viscous model is included.

Author (GRA)

N82-33097# Stanford Univ., Calif. Lab. of Information Systems.

TIME-VARIANT AND TIME-INVARIANT LATTICE FILTERS FOR NONSTATIONARY PROCESSES

T. Kailath May 1982 50 p refs

(Contracts F49620-79-C-0058; DAAG29-79-C-0215; DAAG29-81-K-0057; AF Proj. 2304)

(AD-A116083; AFOSR-82-0481TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The structure of second-order processes is exposed by specification of whitening filters and modeling filters, or equivalently by Cholesky decompositions of the covariance matrix and its inverse. We shall show that these filters can be obtained as a cascade of lattice sections, each specified by a single so-called reflection coefficient parameter. For stationary processes, the reflection coefficient will be time-invariant. For nonstationary processes we can use the displacement rank concept either to find a simple time-update formula for the reflection coefficients or to replace them by a time-invariant vector reflection coefficient of size governed by the displacement rank of processes. These results are obtained in a quite direct way by using a geometric (Hilbert-space) formulation of the problem, combined with old results of Yule (1907) on update formulas for partial correlation coefficients

and of Schur (1917) and Szego (1939) on the classical moment problem. Author (GRA)

N82-33098# Center for Naval Analyses, Alexandria, Va. Operations Analysis Group.
AGGREGATION OF CONDITIONAL ABSORBING MARKOV CHAINS
C. Bernard Barfoot Jun. 1982 14 p refs Presented at the 6th European Meeting on Cybernetics and Systems Res., Vienna, 13-16 Apr. 1982
(Contract N00014-76-C-0001)
(AD-A116603; CNA-PP-352) Avail: NTIS HC A02/MF A01 CSCL 12/1

When modeling a process by means of a finite Markov chain, it is sometimes necessary or desirable to stratify the process into subprocesses and model each of these individual subprocesses. For example, in a study of a distributed data base system (1) the flow of data was modeled as a Markov chain for several separate geographic locations. In a recruiting study (2) the movement of military-age men through the recruiting process and into the armed forces was modeled for separate racial and educational groups as a Markov chain with a single state space for each group--only the input data (transition probabilities) to the model were changed for each group. In (3) a Markov chain model was used to investigate the consequences of induced abortion for different groups of women by estimating transition probabilities separately for each group. GRA

N82-33099# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A NEW METHOD OF SOLVING III-CONDITIONED SYSTEMS OF EQUATIONS M.S. Thesis
Brian S. Birmingham Dec. 1981 37 p refs
(AD-A115569; AFIT/GA/MA/81D-1) Avail: NTIS HC A03/MF A01 CSCL 12/1

The problems associated with ill-conditioned matrices are well known and widespread. As of yet, there are no general solutions to the problem. The only remedies are usually ad hoc and are extremely case-dependent. This paper presents a method which gives good results for a large variety of situations. The method involves masking, a technique which sets the lower-order bits (the number of bits varies) to zero, and then applying standard system-of-equations solvers. Most of the computer runs made used the Hilbert matrix, and either a specified b vector (as in the form, Ax = b), or a specified x vector, with the b obtained by multiplying x by A. Author (GRA)

N82-33100# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
REDUCIBILITY OF MATRIX EQUATIONS CONTAINING SEVERAL PARAMETERS M.S. Thesis
Charles A. Lew Dec. 1981 53 p refs
(AD-A115568; AFIT/GE/MA/81D-1) Avail: NTIS HC A04/MF A01 CSCL 12/1

Two methods of reducing state matrix equations containing several parameters are presented in this thesis. Pursuant to the first method, the solutions, obtained by iterative and non-iterative methods, of the algebraic Riccati matrix equation and Lyapunov matrix equation are relied upon heavily. The second method hinges on an equivalence transformation to a Smith form, coupled with the notion of zeros of a matrix. Main results focus on the two parameter case but can be extended to any number of parameters. Author (GRA)

N82-33101# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
COMPARISON OF ESTIMATION TECHNIQUES FOR THE FOUR PARAMETER BETA DISTRIBUTION M.S. Thesis
David E. Bertrand Dec. 1981 87 p refs
(AD-A115562; AFIT/GOR/MA/81D-1) Avail: NTIS HC A05/MF A01 CSCL 12/1

This thesis compares three estimation techniques in application to the beta distribution: method of moments, maximum likelihood, and minimum distance. The four parameter version of the beta distribution is used; it has two shape parameters, and upper and lower limit parameters. Linear interpolation on order statistics is used to find initial estimates of the limits. The classical estimation procedures, method of moments and maximum likelihood, are applied through procedures found in the literature. A newer technique, minimum distance, is applied for the first time to the beta distribution. Comparison of estimation techniques is accomplished using Monte Carlo analysis. Five sample sizes are considered -- 4, 8, 12, 16, and 20 -- and three pairs of shape parameters -- (3,3), (9,4), and (1,2) -- for a total of fifteen cases. One thousand samples are generated for each case, and each estimation technique is then applied to all samples. GRA

N82-33102# North Carolina Univ., Chapel Hill. Inst. of Statistics.
A CONSISTENT ESTIMATE OF A NONPARAMETRIC SCALE PARAMETER
Gerald L. Sievers May 1982 25 p refs
(Contract N00014-78-C-0637; NR Proj. 042-407)
(AD-A115803; MIMEO-SER-1501) Avail: NTIS HC A02/MF A01 CSCL 12/1

A consistent estimate is proposed for the scale parameter integral of f squared in the model Y sub i = mu sub i + e sub i, 1 < or = i < or = n, where the mu sub i are unknown location parameters and the e sub i are independent, identically distributed random errors with density function f. This parameter arises in the variance formula for rank estimates of location. The proposed estimate is based on differences of residuals Y sub i *mu sub i, where *mu sub i is an estimate of mu(i). When the mu(i) follow the structure of the general linear model, the estimate is shown to be consistent under the usual assumptions on the design matrix. The estimate does not require the symmetry of the density f. GRA

N82-33103# Iowa State Univ. of Science and Technology, Ames. Dept. of Statistics.
A GLOBAL EXISTENCE AND UNIQUENESS THEOREM FOR A RICCATI EQUATION Interim Report, 1 Dec. 1977 - 31 Aug. 1981
J. Colby Kegley 1981 23 p refs
(Grant AF-AFOSR-3518-78; AF Proj. 2304)
(AD-A116021; AFOSR-82-0491TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is proved that a Riccati differential equation of a particular form has a unique solution satisfying the conditions that it is to exist for large values of the independent variable t and to have its graph stay above a certain line for large t. It is then proved that the solution exists for all t. Two forms of the solution are developed in terms of the confluent hypergeometric functions. An application of these results is made to an asymptotic stochastic analysis of a noisy dual problem. Author (GRA)

N82-33104# Maryland Univ., College Park.
NUMERICAL SOLUTION OF SYSTEMS OF NONLINEAR EQUATIONS Final Report
James A. Yorke 15 May 1982 5 p refs
(Contract DAAG29-80-C-0040)
(AD-A115835; ARO-16538.2-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

The research on this grant explored homotopy continuation methods as a way of solving systems of nonlinear equations. One paper published under this grant describes regularity properties when the homotopy is analytic. Another describes homotopies for which the functions are piecewise analytic. Author (GRA)

N82-33105# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
A MODEL FOR EQUI-JOIN QUERY PROCESSING IN DISTRIBUTED RELATIONAL DATABASES
Kuan-Tsae Huang and B. Wilbur, Jr. Dec. 1981 21 p refs
(Contract N00014-77-C-1532)
(AD-A115980; LIDS-P-1211) Avail: NTIS HC A02/MF A01 CSCL 09/2

We develop a mathematical model to compute the minimum communication cost of a join-semijoin program for processing a given equi-join query. Some definitions and conditions upon which this paper is based are stated. We define a query processing graph for each equi-join query and characterize the set of join-semijoin programs which solve this query. A rule for estimating the size of the derived relation is derived. The parameters for estimating the size of derived relation form a consistent parameter system. With the assumption of communication cost dominance, the cost functions are linear in the size of data transmission. An optimization problem for distributed query processing is well formulated. GRA

N82-33106# Rochester Univ., N. Y. Graduate School of Management.
EFFORTS IN MARKOV MODELING OF WEATHER DURATIONS Final Report, 1 Oct. 1979 - 30 Sep. 1981
Julian Keilson Hanscom AFB, Mass. AFGL 15 Feb. 1982 6 p refs
(Contract F19628-80-C-0003; AF Proj. 6670)
(AD-A115793; AFGL-TR-82-0074) Avail: NTIS HC A02/MF A01 CSCL 12/1

A portable version of the algorithm for finding the maximum of Gaussian-Markov weather variates has been obtained employing cubic B-splines. Efforts to model and predict equipment response to temperature modified by the thermal lag of the equipment are described. Author (GRA)

N82-33107# Stanford Univ., Calif. Systems Optimization Lab.
ON THE CONVERGENCE OF A SEQUENTIAL QUADRATIC PROGRAMMING METHOD WITH AN AUGMENTED LAGRANGIAN LINE SEARCH FUNCTION
Klaus Schittkowski Jan. 1982 26 p refs
(Contracts N00014-75-C-0267; DAAG29-79-C-0110; DE-AM03-76SF-00326; Grants NSF MCS-81-19774; NSF MCS-79-26009; NSF ECS-80-12974)
(AD-A115667; ARO-18424.5-MA; SU-SOL-TR-82-4) Avail: NTIS HC A03/MF A01 CSCL 12/1

Sequential quadratic programming methods as developed by Wilson, Han, and Powell have gained considerable attention in the last few years mainly because of their outstanding numerical performance. Although the theoretical convergence aspects of this method and its various modifications have been investigated in the literature, there still remain some open questions which will be treated in this paper. The convergence theory to be presented, takes into account the additional variable introduced in the quadratic programming subproblem to avoid inconsistency, the one dimensional minimization procedure, and, in particular, an 'active set' strategy to avoid the recalculation of unnecessary gradients. This paper also contains a detailed mathematical description of a nonlinear programming algorithm which has been implemented by the author. GRA

N82-33108# Stanford Univ., Calif. Dept. of Computer Science.
NUMERICAL SOLUTION OF TRANSPORT EQUATIONS Ph.D. Thesis
William D. Gropp Dec. 1981 109 p refs
(Contract N00014-75-C-1132)
(AD-A115989; SU-STAN-CS-81-888) Avail: NTIS HC A06/MF A01 CSCL 12/1

In this dissertation we discuss the numerical solution of systems of hyperbolic partial differential equations with lower order terms and step function initial data. These equations arise in modeling the propagation of a signal with loss, such as a signal in a resistive co-axial cable, or the flow of neutrons in a reactor. Majda and Osher have shown that dissipative finite difference approximations to such problems display a numerical artifact which is not encountered for scalar equations. Namely, noise from an initial discontinuity propagates into a large region behind the discontinuity. Their results do not apply in the vicinity of a discontinuity, and our goal is to discover the detailed behavior in this region. This information will be of use in constructing algorithms that attempt to accurately approximate solutions with discontinuities or shocks. GRA

N82-33109# Stanford Univ., Calif. Dept. of Electrical Engineering.
APPLICATION OF LEAST-SQUARES ALGORITHMS TO ADAPTIVE ECHO CANCELLATION
V. U. Reddy, F. K. Soong, A. M. Peterson, and T. Kailath Dec. 1981 9 p refs Presented at the Intern. Symp. on Microwaves and Comm., Kharagpur, India, Dec. 1981
(Contracts F49620-79-C-0058; DAAG29-81-C-0057; DAAG29-79-C-0215; Grant NSF ENG-78-10003; AF Proj. 2304)
(AD-A115997; AFOSR-82-0466TR) Avail: NTIS HC A02/MF A01 CSCL 17/2

A modified Recursive Least-Square algorithm is presented for echo cancellation. The modified RLS algorithm freeze the adaptive gain during double-talking periods to improve the convergence performance of adaptive echo canceller. A lattice filter structure of echo canceller is also given based on exact least-squares algorithm. The new algorithm with superior convergent speed can be implemented using VLSI. Author (GRA)

N82-33110*# Brown Univ., Providence, R. I. Center for Dynamical Systems.
ESTIMATION OF DELAYS AND OTHER PARAMETERS IN NONLINEAR FUNCTIONAL DIFFERENTIAL EQUATIONS
H. T. Banks and P. L. Daniel (Southern Methodist Univ., Dallas, Tex.) Dec. 1981 48 p refs
(Contracts NAS1-15810; NAS1-16394; DAAG29-79-C-0161; Grants AF-AFOSR-0198-81; NSF MCS-79-05774)
(NASA-CR-169225; NAS 1.26:169225; AD-A117068; LCDS-82-2; AFOSR-82-0533TR) Avail: NTIS HC A03/MF A01 CSCL 21/1

We discuss a spline-based approximation scheme for nonlinear nonautonomous delay differential equations. Convergence results (using dissipative type estimated on the underlying nonlinear operators) are given in the context of parameter estimation problems which include estimation of multiple delays and initial data as well as the usual coefficient-type parameters. A brief summary of some of our related numerical findings is also given. GRA

N82-33111# Brown Univ., Providence, R. I. Center for Dynamical Systems.
A LIAPUNOV FUNCTIONAL FOR LINEAR VOLTERRA INTEGRODIFFERENTIAL EQUATIONS
D. L. Abrahamson and E. F. Infante (NSF, Washington, D.C.) Jan. 1982 25 p refs
(Grants NSF MCS-79-05774; AF-AFOSR-0198-81; AF Proj. 2304)
(AD-A117067; LCDS-82-7; AFOSR-82-0535TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Liapunov functionals of quadratic form have been used extensively for the study of the stability properties of linear ordinary, functional and partial differential equations. In this paper, a quadratic functional V is constructed for a linear Volterra intergrodifferential equation. This functional, and its derivative, is more general than previously constructed ones and still retains desirable computational qualities; moreover, it represents a natural generalization of the Liapunov function for ordinary differential equations. The method of construction used suggests functionals which are useful for more general equations. GRA

N82-33112# Brown Univ., Providence, R. I. Center for Dynamical Systems.
STABLE EQUILIBRIA WITH VARIABLE DIFFUSION Interim Report
Michel Chipot (Univ. de Nancy I-EUR, France) and Jack K. Hale Mar. 1982 8 p refs
(Contract DAAG29-79-C-0161; Grants AF-AFOSR-0198-81; NSF MCS-79-05774; AF Proj. 2304)
(AD-A117051; LCDS-M-82-5; AFOSR-82-0511TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

For a scalar nonlinear parabolic equation in one space dimension with homogeneous Neumann boundary conditions,

criteria are given on the diffusion coefficient to ensure that the stable equilibrium solutions are constant functions regardless of the nonlinearities. The Dirichlet problem is also discussed.
Author (GRA)

N82-33113# Brown Univ., Providence, R. I. Center for Dynamical Systems.
DYNAMIC BEHAVIOR FROM ASYMPTOTIC EXPANSIONS Interim Report
Jack K. Hale and Luiz Carlos Pavlu (Univ. Federal de Sao Carlos, Brazil) May 1982 22 p refs
(Contract DAAG29-79-C-0161; Grants AF-AFOSR-0198-81; NSF MCS-79-05774; AF Proj. 2304)
(AD-A117261; LCDS-82-11; AFOSR-82-0512TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The purpose of this paper is to discuss stability properties of solutions of periodic and almost periodic differential equations containing a small parameter. The existence of the solution can be obtained in the first approximation but the stability only after k-approximations. We obtain the results using asymptotic expansions, higher order averaging and the concept of exponential hyperbolicity of order k. Author (GRA)

N82-33114# Oak Ridge National Lab., Tenn. Computer Sciences Div.
NITPACK: A NUMERICAL INTERACTIVE TREE PACKAGE
P. W. Gaffney, J. W. Wooten, and K. A. Kessel 1981 73 p refs Presented at the SLATEC Meeting, Oak Ridge, Tenn., 6 Oct. 1981
(Contract W-7405-eng-26)
(DE82-001481; ORNL/CSD-89; CONF-811079-1-Draft) Avail: NTIS HC A04/MF A01

A package of transportable FORTRAN programs for computer aided decision trees is described. The name of the package is NITPACK and it consists of two primary programs called NITREE and NIT. The purpose of NITREE is to convert a decision tree or flow chart into a format that may be transmitted to a user at a computer terminal. The actual transmission is performed by the companion program NIT. By responding at the terminal to the questions displayed by NIT, the user is guided through the corresponding path in the tree. DOE

N82-33115# Aquila Univ. (Italy). Inst. di Elettrotecnica.
SYSTEMS, MEMORY, CASUALTY, EVOLUTION AND RECURSIVE EQUATIONS
Paolo d'Alessandro and Manuela DallaMora Feb. 1982 28 p refs
(Contract CNR-81.01992.11; Grant CNR/CT-81.03025.10)
(Rept-04-82; ISSN-0392-5331) Avail: NTIS HC A03/MF A01

The foundations of the theory of discrete time systems are outlined. The relationship of the basic concepts with descriptions of systems in terms of input, state and output variables, of recursive equations for the state variable, and instantaneous equations for the output variable, is examined. A function space approach is adopted. It is shown that, because of memory and causality, time-invariant systems can be described by recursive equations and read-out maps. State variables assume values in a reduced state space. In linear systems, the homogeneous part of the state recursive equation is governed by a semigroup of linear operators. As well as formalizing the concepts of dynamics and evolution, the approach offers a theoretical framework for problems involving input-output rather than input-state-output descriptions of processes. Econometrics problems, which involve systems not clearly identifiable as abstract, can be tackled. Author (ESA)

N82-33116# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
SEQUENTIAL LIKELIHOOD RATIO TESTS
Sture Holm 1982 60 p refs
(CTH-Math-1982-4) Avail: NTIS HC A04/MF A01

The problem of testing hypotheses that concern one main parameter in the presence of a nuisance parameter by sequential tests based on independent identically distributed random variables, available in successive experiments of the same kind, is discussed. The properties of different likelihood methods are examined and compared. By developing asymptotic theory, (a) how the properties are changed by reparameterization, (b) how the properties are affected by allowing the test limits to depend on nuisance parameter estimates, (c) what the possibilities are of steering the test properties by reparameterization or by using test limits which depend on nuisance parameter estimates, and (d) optimality properties of the tests are shown. Author (ESA)

N82-33117# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
A NONEXISTENCE THEOREM FOR TRANSLATION INVARIANT OPERATORS ON WEIGHTED L SUB p SPACES
Joergen Loefstroem 1982 16 p refs
(CTH-Math-1982-5) Avail: NTIS HC A02/MF A01

Translation invariant operators, frequently used in approximation and interpolation theory or in the study of partial differential operators, are considered. On the Lebesgue space, L sub P, translation invariant operators can be represented as convolutions with a tempered distribution. After Fourier transformation, the translation invariant operator appears disguised as a Fourier multiplier. The L sub P theory for translation invariant operators can be extended, at least partly, to weighted L sub P spaces, denoted L sub P (w), for certain weight functions, w, closely connected to positive polynomials. Weight functions, w, with a bad behavior of infinity are treated. As an example, w (x) = exp (+ or - (the absolute value of x) to the alpha-th power), alpha > 1, is mentioned. It is proven that there are no translation invariant operators T on L sub P (w) other than the obvious one Tf = cf (c = a constant). Author (ESA)

N82-33118# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
L-INFINITE ESTIMATES FOR THE SPACE-HOMOGENEOUS BOLTZMANN EQUATION
Leif Arkeryd 1982 21 p refs
(CTH-Math-1982-6) Avail: NTIS HC A02/MF A01

Boundedness of solutions, f, of the initial value problem for the space-homogeneous Boltzmann equation for inverse K-th power forces, when K > 5 and under angular cutoff, is studied. Results show that (1 + (absolute value of v)) to the s/-th power (f sub t) belongs to L infinite for t > zero and ess (v, t) sup (1 + (the absolute value of v)) to the s/-th power (f)(v, t) > infinity for any s/ < or = s when s < or = 5 and any s/ < s, if s > s, if f sub zero > or = zero with (1 + (the absolute value of v) squared) f sub zero belongs to L sup 1 and (1 + (the absolute value of v)) to the s-th power (f sub zero) belongs to L infinite for some s > 2. Author (ESA)

N82-33119# Oxford Univ. (England). Dept. of Engineering Science.
PRINCIPAL GAINS AND PHASES: INSENSITIVE ROBUSTNESS MEASURES FOR ASSESSING THE CLOSED-LOOP STABILITY PROPERTY
Basil Kouvaritakis and Ian Postlethwaite 1982 32 p refs
(OUEL-1402/82) Avail: NTIS HC A03/MF A01

An improved version of the principal gain phase method for assessing the robustness of the closed loop stability property is presented. Two lemmas which combine to give improve bounds and which are derived from the bound conditions theorem in the original principal gain phase method are demonstrated. The results are established for a multiplicative type perturbation before the plant, but the same arguments can be used to derive similar results for either a multiplicative type perturbation after the plant or an additive plant perturbation. Conditions for which the principal gain phase method is insensitive to small system perturbations are derived. Author (ESA)

N82-33120# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
IMPLEMENTABLE DIFFERENTIAL EQUATIONS FOR NONLINEAR FILTERING

H. A. P. Blom 17 May 1981 10 p refs Presented at 2nd Symp. on Inform. Theory in the Benelux, Zoetermeer, Netherlands 21 May 1981
(NLR-MP-81037 U) Avail: NTIS HC A02/MF A01

The representation of a stochastic differential equation for the conditional density of the state of a Markov process, observed in white Gaussian noise is considered. The problem presented by the physical interpretation of the stochastic differential, as it can not be interpreted in the Wiener sense, is solved by special transformations. For finite state Markov processes, the results can be implemented directly, and a specific application for a binary Markov chain is discussed. Author (ESA)

N82-33121# Sheffield Univ. (England). Dept. of Control Engineering.
OPTIMALITY CONDITIONS FOR THE EXTREME DIFFERENCE OF CONJUGATE FUNCTIONS
Y. L. Xiong (Huazhong Inst. of Sci. and Technol., China) and S. P. Banks 1982 16 p refs
(RR-178) Avail: NTIS HC A02/MF A01

Basic properties of conjugate functions are applied to the optimality problem of the extreme difference of such functions. The basic definitions are reviewed and a fundamental theorem of the theory of conjugate functions is proved. This theorem is an extension of the conjugate strong duality theorems and it removes certain convexity assumptions with specific reference to the case where f=g. A practical optimization method is also presented. Author (ESA)

N82-33122# Cambridge Univ. (England). Dept. of Engineering.
RIGHT DIVISORS OF NUMERATOR POLYNOMIAL MATRICES AND (A, B)-INVARIANT SUBSPACES
A. I. G. Vardulakis 1980 36 p refs
(PB82-170705; CUED/F-CAMS/TR-203-1980; ISSN-0309-765X) Avail: NTIS HC A03/MF A01 CSCL 12A

In the past few years a number of papers appeared with the major objective of providing connections between the geometric and the polynomial matrix approaches to linear system theory. In one of these studies, the intimate connection between the concepts of a numerator polynomial matrix appearing in a special matrix fraction description of the transfer function matrix of a linear system sigma (A,B,C) and that of the maximal (A,B)-invariant subspace contained in ker C has been established. The primary purpose here is to further investigate and generalize the above mentioned results. Author

N82-33123# Cambridge Univ. (England). Dept. of Engineering.
ON THE STATE FEEDBACK DIAGONAL DECOUPLING OF LINEAR SYSTEMS DESCRIBED BY (A, B, C, E,) QUADRUPLES
A. I. G. Vardulakis 1980 21 p refs
(PB82-170663; CUED/F-CAMS/TR-206-1980; ISSN-0309-765X) Avail: NTIS HC A02/MF A01 CSCL 12A

Given a linear multivariable system sigma = (A,B,C,E) giving rise to a proper (mxm), non-singular, transfer function matrix T(s), an alternative necessary and sufficient condition is presented for the solvability of the diagonal decoupling and simultaneous pole assignment problem by the use of state feedback and input coordinate transformations using a polynomial matrix approach. The proof of the necessary and sufficient condition is constructive, and apart from giving rise to a simple decoupling algorithm, it can also be used in oder to investigate the structure of the resulting closed-loop decoupled system. Author (GRA)

N82-32534*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A STRUCTURE FUNCTION REPRESENTATION THEOREM WITH APPLICATIONS TO FREQUENCY STABILITY ESTIMATION
C. A. Greenhall *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 37-46 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 12A

N82-32536*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A PARALLEL VLSI ARCHITECTURE FOR A DIGITAL FILTER OF ARBITRARY LENGTH USING FERMAT NUMBER TRANSFORMS
T. K. Truong, I. S. Reed, C. S. Yeh, and H. M. Shao *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 60-71 refs Prepared in cooperation with Univ. of Southern California, Pasadena (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 12A

N82-32537*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE VLSI DESIGN OF A REED-SOLOMON ENCODER USING BERLEKAMPS BIT-SERIAL MULTIPLIER ALGORITHM
T. K. Truong, L. J. Deutsch, I. S. Reed, I.-S. Hsu, K. Wang, and C.-S. Yeh *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 72-86 refs Prepared in cooperation with Univ. of Southern California, Pasadena (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 12A

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N82-33124*# Wisconsin Univ., Madison. Dept. of Statistics.
VARIATIONAL METHODS IN SIMULTANEOUS OPTIMUM INTERPOLATION AND INITIALIZATION
Grace Wahba Aug. 1982 10 p refs Sponsored by NASA
(NASA-CR-169307; NAS 1.26:169307; TR-692) Avail: NTIS HC A02/MF A01 CSCL 12A

The duality between optimum interpolation and variational objective analysis, is reviewed. This duality is used to set up a variational approach to objective analysis which uses prior information concerning the atmospheric spectral energy distribution, in the variational problem. In the wind analysis example, the wind field is partitioned into divergent and nondivergent parts, and a control parameter governing the relative energy in the two parts is estimated from the observational data being analyzed by generalized cross validation, along with a bandwidth parameter. A variational approach to combining objective analysis and initialization in a single step is proposed. In a simple example of this approach, data, forecast, and prior information concerning atmospheric energy distribution is combined into a single variational problem. This problem has (at least) one bandwidth parameter, one partitioning parameter governing the relative energy in fast slow modes, and one parameter governing the relative weight to be given to observational and forecast data. S.L.

N82-33125# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
IMAGE REGISTRATION BY SEQUENTIAL TESTS OF HYPOTHESIS: GAUSSIAN AND BINOMIAL TECHNIQUES
Nelson D. A. Masacrenhas and Jose A. G. Pereira May 1982 14 p refs Presented at 16th Intern. Symp. on Remote Sensing of Environ., Buenos Aires, 2-9 Jun. 1982
(INPE-2397-PRE/113) Avail: NTIS HC A02/MF A01

An approach to translational image registration problems based on the theory of sequential tests of hypotheses is proposed. Two different methods are developed: the first is based on the Gaussian assumption and uses the fact that the variance of the error between two images to be registered tends to be low on the registration point; the second method uses binary images derived from the original ones. The statistical model for the resulting accumulated error is a binomial distribution and the registration position is characterized by a low probability of the binary error being one. In both methods two sequences of thresholds are employed: one leading to the rejection of the point and the other one to the eventual acceptance of it. Experimental results with both methods

are presented. They include registration of a LANDSAT image against noisy versions of it, as well as matching of different channels of the same multispectral image. Successful registration was achieved in most cases even in low signal to noise ratio conditions, with a modest amount of computational effort. Author

N82-33126# Pennsylvania State Univ., University Park. Dept. of Statistics.
RANK-BASED INFERENCE WITHOUT SYMMETRIC ERRORS
James C. Aubuchon and Thomas P. Hettmansperger Jun. 1982 22 p refs Submitted for publication
(Contract N00014-80-C-0741; NR Proj. 042-446)
(AD-A116432; TR-42) Avail: NTIS HC A02/MF A01 CSCL 12/1

Statistical inference based on ranks is reviewed. The role of a parameter and methods for its estimation are discussed. In particular, the use of density estimation methods is shown to provide a consistent estimate without the assumption of symmetry of the underlying distribution. The use of a consistent estimate in constructing hypothesis tests in the linear model without assuming symmetry is discussed. GRA

N82-33127# Illinois Univ., Chicago. Dept. of Quantitative Methods.
SOME ASPECTS OF INFERENCE FOR MULTIVARIATE INFINITELY DIVISIBLE DISTRIBUTIONS
Stanley L. Sclove 15 Jun. 1982 21 p refs
(Contract N00014-80-C-0408)
(AD-A116582; TR-82-3) Avail: NTIS HC A02/MF A01 CSCL 12/1

Measurement of dependence in the infinitely divisible class of multivariate distributions, based on developments in probability theory for that class, is discussed. It has been shown that pairwise independence is equivalent to mutual independence in the infinitely divisible class. When the infinitely divisible variables contain no normal component (in particular, when they are discrete), the cumulant of order (2,2) can be used as a measure of pairwise dependence; when a normal component is present, the appropriate measure of pairwise dependence also involves the covariance. Results for testing independence of infinitely divisible random variables are discussed. A method of testing normality against infinitely divisible alternatives is given. Author (GRA)

N82-33128# Colorado Univ., Boulder. Dept. of Computer Science.
A FAMILY OF TRUST REGION BASED ON ALGORITHMS FOR UNCONSTRAINED MINIMIZATION WITH STRONG GLOBAL CONVERGENCE PROPERTIES
Gerald A. Schultz, Robert B. Schnabel, and Richard H. Byrd 10 Mar. 1982 40 p refs
(Contract DAAG29-81-K-0108; Grant NSF MCS-81-15475)
(AD-A115785; ARO-18197.1-MA; CU-CS-216-82) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper has two aims: to exhibit very general conditions under which members of a broad class of unconstrained minimization algorithms are globally convergent in a strong sense, and to propose several new algorithms that use second derivative information and achieve such convergence. In the first part of the paper, we present a general trust region based algorithm schema that includes an undefinded step selection strategy. We give general conditions on this step selection strategy under which limit points of the algorithm will satisfy first and second order necessary conditions for unconstrained minimization. Our algorithm schema is sufficiently broad to include line search algorithms as well. Next, we show that a wide range of step selection strategies satisfy the requirements of our convergence theory. This leads us to propose several new algorithms that use second derivative information and achieve strong global convergence, including an indefinite line search algorithm, several indefinite dogleg algorithms, and a modified optimal-step algorithm. Finally, we propose an implementation of one such indefinite dogleg algorithm.
Author (GRA)

N82-33129# Cornell Univ., Ithaca, N. Y. School of Operations Research and Industrial Engineering.
CLOSED ADAPTIVE SEQUENTIAL PROCEDURES FOR SELECTING THE BEST OF K OR = 2 BERNOULLI POPULATIONS
Robert E. Bechhofer and Radhika V. Kulkarni Jul. 1981 56 p refs
(Contracts DAAG29-80-C-0036; N00014-75-C-0586)
(AD-A115653; TR-510) Avail: NTIS HC A04/MF A01 CSCL 12/1

The goal of selecting that one of k > or = 2 Bernoulli populations which has the largest single-trial 'success' probability is treated. Consideration is restricted to procedures which take no more than n observations from any one of the K populations. One such procedure is the single-stage procedure of Sobel and Huyett (1957) which takes exactly n observations from each of the k population. We propose a one-at-a-time adaptive sampling rule (R*) which when used in conjunction with a particular stopping rule (S*) and terminal decision rule (T*) achieves the same probability of a correct selection as does the single-stage procedure uniformly. The procedure (R*, S*, T*) is generalized for k > 2 to accommodate such goals as 'Selecting the s (1 < or = s < or = k-1) 'best' Bernoulli populations with regard to order,' and is shown to have desirable properties for these goals as well. GRA

N82-33130# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A MODIFIED CRAMER-VON MISES AND ANDERSON-DARLING TEST FOR THE WEIBULL DISTRIBUTION WITH UNKNOWN LOCATION AND SCALE PARAMETERS M.S. Thesis
John Gregory Bush Dec. 1981 156 p refs
(AD-A115575; AFIT/GOR/MA/81D-2) Avail: NTIS HC A08/MF A01 CSCL 12/1

The Anderson-Darling and Cramer-von Mises critical values are generated for the three-parameter Weibull distribution. The critical values are used for testing whether a set of observations follows a Weibull distribution when the scale and location parameters are unspecified and are estimated from the sample. A Monte Carlo simulation, with 5000 repetitions, is used to generate critical values for sample sizes 5(5)30 and Weibull shape parameter .5(.5)4.0. A Monte Carlo power investigation of the Anderson-Darling and Cramer-von Mises tests is made using 5, 15, and 25 observations from ten alternate distributions. The power of the two tests are compared to the Kolmogorov-Smirnov and the Chi-Square tests. The power of all the tests are low with a sample size of five. When the hypothesized distribution is the Weibull with shape equal 1.0, the power of the tests in decreasing order are: Cramer-von Mises, Anderson-Darling, Kolmogorov-Smirnov, and Chi-Square. When the hypothesized distribution is the Weibull with shape equal 3.5, the power of the tests are the Anderson-Darling, followed by the Cramer-von Mises, Kolmogorov-Smirnov, and the Chi-Square test. GRA

N82-33131# Brasov Univ. (Rumania).
RECENT ADVANCES IN STATISTICAL MECHANICS
1980 705 p refs Proceedings of conf. held in Poiana Brasov, Rumania, 30 Aug. 1979
(INIS-mf-6084) Avail: NTIS (US Sales Only) HC A99/MF A01; DOE Depository Libraries

Statistical mechanics and its application to several physical systems is addressed. Phase transition, quantum mechanics, gas mechanics, solid state and biochemistry are discussed. DOE

N82-33132# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
CONDITIONING IN POINT PROCESSES
Olav Kallenberg May 1982 80 p refs
(CTH-Math-1982-7) Avail: NTIS HC A05/MF A01

A systematic theory of conditioning in point processes on locally compact spaces with a countable base is developed. Underlying ideas go back to applied work in statistical mechanics and queueing theory. A general theory of multivariate Palm measures without any moment restrictions is presented. In the point process case, basic relations to thinning and elementary

conditioning are discussed. A fundamental decomposition of a random measure distribution and its associated supporting measure is considered. A family of conditional distributions is treated. A fundamental role is played by the concept of Gibbs kernel and by the closely related notion of Papangelou kernels. The Gibbs kernel is essentially equivalent to a family of Palm measures; the most convenient way of defining Gibbs and Papangelou kernels is by desintegration of appropriate Campbell measures. The asymptotic behavior of the conditional distributions is shown. An explicit representation of Papangelou kernels is derived and a better understanding of regularity conditions is achieved. Author (ESA)

N82-33133# Loughborough Univ. of Technology (England). Dept. of Mathematics.
TIED RANK ANALYSES AND THE GROUPED CONTINUOUS MODEL FOR ORDERED CATEGORIAL DATA
A. N. Pettitt May 1982 17 p refs
(Maths-Res-163) Avail: NTIS HC A02/MF A01

Using a marginal likelihood based on ranks adapted for ties, it is shown that inference based on ranks is asymptotically equivalent to inference based on a grouped continuous model when data are the tied, grouped continuous or the ordered categorical type. Approximations which make the rank analysis practical to use are given. Two numerical examples, involving a two-sample problem and a regression problem, are presented. Results are similar, but rank analysis is preferable to the group continuous model for moderate to large number of categories and small to moderate sample sizes. Author (ESA)

N82-33134# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
THE PROBABILITY DISTRIBUTION FOR THE RATIO OF VARIABLES HAVING A NORMAL DISTRIBUTION
R. M. Jones Nov. 1981 15 p refs
(PB82-169525; NOAA-TM-ERL-WPL-84; NOAA-81122903) Avail: NTIS HC A02/MF A01 CSCL 12A

The probability density function is derived for the ratio of two independent random variables, each of which has a normal distribution. When the variances of the normal distributions are small, a simplifying approximation to the probability density function for the ratio of the two variables is valid; the lower tail of the approximate distribution is approximately normal. This result validates the bias-correction calculation for minimum-envelope processing of skywave radar sea-echo spectra. The distribution function for the ratio approaches a normal distribution as the variances for the numerator and denominator distributions approach zero, in agreement with previous, related calculations.
Author (GRA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N82-33135*# Martin Marietta Aerospace, Denver, Colo.
DEVELOPMENT OF AN AUTONOMOUS VIDEO RENDEZOUS AND DOCKING SYSTEM Final Report
John C. Tietz and Joy H. Kelly Jun. 1982 284 p refs
(Contract NAS8-34679)
(NASA-CR-162076; NAS 1.26:162076; MCR-82-569) Avail: NTIS HC A13/MF A01 CSCL 12B

Video control systems using three flashing lights and two other types of docking aids were evaluated through computer simulation and other approaches. The three light system performed much better than the others. Its accuracy is affected little by tumbling of the target spacecraft, and in the simulations it was able to cope with attitude rates up to 20,000 degrees per hour about the docking axis. Its performance with rotation about other axes is determined primarily by the state estimation and goal setting portions of the control system, not by measurement accuracy. A suitable control system, and a computer program that can serve as the basis for the physical simulation are discussed. Author

N82-33136# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ANALYSIS OF THE UNCAPACITATED DYNAMIC LOT SIZE PROBLEM
Gabriel R. Bitran (MIT, Cambridge), Thomas L. Magnanti (MIT, Cambridge), and Horacio H. Yanasse Jul. 1982 41 p refs
(Contract N00014-75-C-0556; Grant NSF 79-26625-ECS)
(INPE-2472-PRE/161; Sloan-WP1282-82) Avail: NTIS HC A03/MF A01

Worst case error bounds for several heuristics are provided for the uncapacitated dynamic lot size problem. The authors propose two managerially oriented procedures and show that they have a relative worst case error bound equal to two, and develop similar analyses for methods known as the 'Silver and Meal' heuristics, the part priod balancing heuristics, and economic order quanitity heuristics (expressed in terms of a time supply of demand). Results on aggregation and partitioning of the planning horizon are also presented. Author

N82-33137# Stanford Univ., Calif. Systems Optimization Lab.
PROCEDURES FOR OPTIMIZATION PROBLEMS WITH A MIXTURE OF BOUNDS AND GENERAL LINEAR CONSTRAINTS
Philip E. Gill, Walter Murray, Michael A. Saunders, and Margaret H. Wright May 1982 18 p refs
(Contracts N00014-75-C-0267; DE-AM03-76SF-00326; DAAG29-79-C-0110; Grants NSF MCS-81-19774; NSF ECS-80-12974)
(AD-A115854; SU-SOL-TR-82-6; ARO-18424.6-MA) Avail: NTIS HC A02/MF A01 CSCL 12/2

When describing active-set methods for linearly constrained optimization, it is often convenient to treat all constraints in a uniform manner. However, in many problems the linear constraints include simple bounds on the variables as well as general constraints. Special treatment of bound constraints in the implementation of an active-set method yields significant advantages in computational effort and storage requirements. In this paper, we describe how to perform the constraint-related steps of an active-set method when the constraint matrix is dense and bounds are treated separately. These steps involve updates to the TQ factorization of the working set of constraints and the Cholesky factorization of the projected Hessian (or Hessian approximation). Author (GRA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N82-33138# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
EXTENDED ASYMPTOTIC FUNCTIONS: SOME EXAMPLES
T. D. Todorov 1980 12 p refs Presented at the Operatoren: Distributionen und Verwandte Non-Standard Methoden, Oberwolfach, BRD, 2-8 Jul. 1978
(JINR-E-5-13019; CONF-7807112-1) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Several examples of extended asymptotic functions are exposed. These examples will illustrate the notions introduced in another paper but at the same time they have a significance as realizations. The important thing is that the asymptotic functions of these examples can be multiplied in the class of the asymptotic functions as opposed to the theory of Schwartz distributions. Some properties of the set of all extended asymptotic functions are considered which are essential for the next step of this approach.
DOE

N82-33139# Hamburg Univ. (West Germany). Inst. fuer Theoretische Physik.
ON THE IMPOSSIBILITY OF EMBEDDING HORIZONTAL AND VERTICAL SUBGROUPS IN HIGHER SIMPLE GROUPS

F. Ghaboussi Dec. 1980 10 p refs
(DE82-780139; DESY-80/130) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

It is shown that the embedding of the vertical SU(2) symmetry and a horizontal SU(2) symmetry group in higher simple symmetry groups SU(4) and SU(6) is not possible. This is proved in a direct way through the matrix algebra of the generators. DOE

N82-33140# Joint Inst. for Nuclear Research, Dubna (USSR).
POLYGONAL PATH APPROXIMATIONS ON THE PATH SPACES OF QUANTUM MECHANICAL SYSTEMS: PROPERTIES OF THE POLYGONAL PATHS
P. Exner (Charles Univ., Prague) and G. I. Kolerov 13 Feb. 1981 10 p refs
(DE82-700495; JINR-E-2-81-110) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Properties of the subset of polygonal paths in the Hilbert space H of paths referring to a d-dimensional quantum mechanical system are examined. Using the reproduction kernel technique it is proved that each element of H is approximated by polygonal paths uniformly with respect to the 'norm' of time interval partitions. This result is applied to prove consistency of the uniform polygonal path extension of the Feynman maps. DOE

N82-33141# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
ON GENERALIZED PERFECT CODES AND STEINER SYSTEMS
Gerard D. Cohen and Peter Frankl (CNRS, Paris) 1981 7 p refs Presented at Colloq. Intern. de Geometrie Combinatoire et Appl., Rome, 7-12 Jun. 1981
(ENST-C-81006) Avail: NTIS HC A02/MF A01

The set of N-sequences of integers mod 2, i.e., (Z sub 2) to the nth power = A, is considered. For any x and y in A, the Hamming distance, H (x,y), counts the number of their different coordinates, i.e. H(x,y) = (the absolute value [i, x sub i does not = y sub i]), and is the weight of x-y, i.e., H(x,y) = H(x-y, the all zero element of A) = W(x-y). The term x is identified with its support, i.e., supp (x) = [i, x sub i = 1], and A with the collection of subsets of [1,2,...,N]. In this case, H(x,y) = (the absolute value of (x symmetric difference Y)) and W(x) = (the absolute value of x). The Hamming sphere of radius r centered on x is expressed. A partition of A with N sub i Hamming spheres of radius r sub i is denoted by P(N, [r sub i], [N sub i], i = 1,2, . . .,s). When s = 1, the centers of the spheres form a perfect r sub 1 error correcting code (N, r sub 1 ## 2 to the kth power). A generalized t-Steiner system is written GS(t,K = [K sub 1, . . .,K sub s], N), i.e., a set of n points and a set of blocks with cardinalities in K so that any t-tuple of points belongs to exactly one block. For s = 1, this is the classical t-Steiner system, written S(t, k, n). Author (ESA)

N82-33142# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
ON CLIQUES AND PARTITIONS IN HAMMING SPACES
Gerard D. Cohen and Peter Frankl (CNRS, Paris) 1981 10 p refs Presented at Colloq. Intern. de Theorie des Graphes et Combinatoire, Marseille-Luminy, France, 15-19 Jun. 1981
(ENST-C-81007) Avail: NTIS HC A02/MF A01

The set of N-tuples of integers mod q, endowed with the Hamming metric H, defined for two elements X = (x sub i), Y = (y sub i) in H sub q as the number of their different coordinates, i.e., H(x,y) = (the absolute value of [i, x sub i does not = y sub i]), is considered. Let the weight of x be w(x) = H (x, the all zero element). An R-clique S is a subset of H sub q so that for any x and y in S, H(x,y) belongs to R contained in [1,2,...,N]. The maximal cardinality of an R-clique is denoted by M(N,R). For E contained in [1,2,...,N], an E-sphere of center X is E(x) = [y belongs to H sub q, H(x,y) belongs to E]; obviously (the absolute value of E(x)) = the summation i belongs to E [(q-1) to the ith power i on to N]. An E-code C is a subset of H sub q so that for any C sub 1 and C sub 2 in C, E(C sub 1) cap E(C sub 2) = the null set. Morever, C is perfect if [E(C), C belongs to C] is a partition of H sub q, which implies (the absolute value of E(x)) scalar product (the absolute value of C) = q to the nth power. In the classical case when E = [0,1,...,e], results are shown for e-spheres and e-codes, which are R-cliques for R = [0,1,...,2e] and R = [2e + 1, 2e + 2,...,N], respectively. Author (ESA)

N82-33143# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
ON LINEAR PREDICTION IN THE SINGULAR CASE [SUR LA PREDICTION LINEAIRE DANS LE CAS SINGULIER]
Claude Gueguen and Menad Sidahmed Sep. 1981 20 p refs In FRENCH; ENGLISH summary Presented at Congr. CNRS, Algorithms Rapides pour le Traitement des Systemes Lineaires, Aussois, France, 21-25 Sep. 1981
(ENST-C-81008) Avail: NTIS HC A02/MF A01

Linear prediction and fast Levinson algorithms are discussed. These algorithms fail to be applicable when one of the principal minors of the signal covariance matrix happens to be singular (or close to singularity). This singular case, both for scalar and vector (multichannel) time series, is investigated. It is shown that the standard lattice can be replaced by a convenient lossless lattice. Various techniques are proposed to leap over the singular case. They are analyzed in terms of generalized Cholesky factors. The multichannel case is handled by a reduction of redundant outputs, leading back to the scalar singular case. The results are applicable to the design of robust least squares linear prediction algorithms and to the use of autoregressive multidimensional array models in antenna array processing. Author (ESA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N82-33144 National Physical Lab., Teddington (England). Div. of Quantum Metrology.
[ACTIVITIES OF THE DIVISION OF QUANTUM METROLOGY] Annual Report, 1980
1982 41 p refs
(NPL-QU-AR80; ISSN-0307-3050) Copyright. Avail: Issuing Activity

Research concerning fundamental constants, optical frequency measurement, thermometry, high temperature gas physics, standards for thermal conductivity, radiometry, photometry, and environmental standards is summarized. Author (ESA)

N82-33145# Howard Univ., Washington, D. C. Dept. of Chemistry.
SURFACE RAMAN SCATTERING FROM EFFERVESCENT MAGNETIC PEROXYBORATES
G. E. Walrafen, P. N. Krishnan (Coppin State College), D. L. Griscom (NRL), and R. Munro 30 Jun. 1982 38 p refs Submitted for publication
(Contract N00014-80-C-0305; NR Proj. 051-733)
(AD-A116899; TR-11) Avail: NTIS HC A03/MF A01 CSCL 20/3

Surface Raman scattering using a spinning technique was investigated for solid NaBO3.4H2O and NaBO3.H2O as well as for electron bombarded peroxyborates heated for various times and at temperatures form 110-180 deg C, and for solid Na2O2 and BaO2. The Raman spectra indicate that the breakdown of peroxy groups is accompanied by the formation of trapped molecular O2. Quantitative Raman intensity data were also obtained as functions of heating time at 115 deg C for the 1556 cm-1 line from O2 and for the 890 and 705 cm-1 lines whose intensities scale with the peroxy concentration. These intensity data were treated by logistics theory, and they were found to be consistent with a second-order auto-catalyzed forward reaction dependent on the product of the peroxy and O2 concentrations, plus a first-order reverse reaction dependent only on the O2 concentration. GRA

N82-33146# Graz Univ. (Austria). Inst. fuer Theoretische Physik.
NOTE ON QUASI-PERIODIC STATES
F. Gesztesy and H. Mitter Sep. 1980 8 p refs Sponsored in part by Fonds zur Foerderung der Wissenschaftlichen Forschung (UNIGRAZ-UTP-11-80) Avail: NTIS HC A02/MF A01

Some subtleties in the existence problem of quasi-periodic states for quantum Hamiltonians periodic in time are pointed out. Such investigation became neccesary with the advent of lasers. L.F.M.

N82-33147# National Bureau of Standards, Washington, D.C.
INTEGRAL EQUATIONS FOR TRANSIENT ELECTROMAGNETIC FIELDS Final Report
Egon Marx Feb. 1982 72 p refs
(PB82-178096; NBS-TN-1157) Avail: NTIS HC A04/MF A01 CSCL 20C

Integral equations for the electric and magnetic fields in free space are derived from Maxwell's equations. The fields are expressed in terms of their initial values, boundary values, and sources with the help of a retarded Green function for the scalar wave equation. These equations are then used to derive integral equations for the surface charge and current densities induced by the scattering of a transient electromagnetic field by perfect conductors. An alternative solution of Maxwell's equations with the help of dyadic Green functions is also presented. Author

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution*.

N82-33148*# Lockheed-Georgia Co., Marietta.
A COMPUTER PROGRAM FOR THE PREDICTION OF NEAR FIELD NOISE OF AIRCRAFT IN CRUISING FLIGHT: USER'S GUIDE
J. G. Tibbetts Jun. 1980 142 p refs
(Contract NAS1-14946)
(NASA-CR-159274; NAS 1.26:159274; LG80ER0069)* Avail: NTIS HC A07/MF A01 CSCL 20A

Detailed instructions for using the near field cruise noise prediction program, a program listing, and a sample case with output are presented. The total noise for free field lossless conditions at selected observer locations is obtained by summing the contributions from up to nine acoustic sources. These noise sources, selected at the user's option, include the fan/compressor, turbine, core (combustion), jet, shock, and airframe (trailing edge and turbulent boundary layers). The effects of acoustic suppression materials such as engine inlet treatment may also be included in the noise prediction. The program is available for use on the NASA/Langley Research Center CDC computer. Comparisons of the program predictions with measured data are also given, and some possible reasons for their lack of agreement presented. J.D.

N82-33149*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
OPERATIONAL EVALUATION OF A PROPPELLER TEST STAND IN THE QUIET FLOW FACILITY AT LANGLEY RESEARCH CENTER
P. J. W. Block Sep. 1982 41 p
(NASA-TM-84523; L-15435; NAS 1.15:84523) Avail: NTIS HC A03/MF A01 CSCL 20A

Operational proof tests of a propeller test stand (PTS) in a quiet flow facility (QFF) are presented. The PTS is an experimental test bed for acoustic propeller research in the quiet flow environment of the QFF. These proof tests validate thrust and torque predictions, examine the repeatability of measurements on the PTS, and determine the effect of applying artificial roughness to the propeller blades. Since a thrusting propeller causes an open jet to contract, the potential flow core was surveyed to examine the magnitude of the contraction. These measurements are compared with predicted values. The predictions are used to determine operational limitations for testing a given propeller design in the QFF. S.L.

N82-33150*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MEASUREMENTS OF MEAN STATIC PRESSURE AND FAR FIELD ACOUSTICS OF SHOCK CONTAINING SUPERSONIC JETS
Thomas D. Norum and John M. Seiner Sep. 1982 199 p refs (NASA-TM-84521; L-15378; NAS 1.15:84521) Avail: NTIS HC A09/MF A01 CSCL 20A

The far field acoustic data base generated in studies of broadband shock noise from supersonic jets is presented. Both conical and contoured nozzles of exit Mach numbers 1.0, 1.5, and 2.0 were tested using unheated air at pressure ratios ranging from 1.9 to 14. Tests were performed both with and without screech suppression tabs. Overall sound pressure variations and representative 1/3-octave and narrowband spectra are presented. The mean static pressure measured within these jets is also surveyed. Author

N82-33151# Wyle Labs., Inc., El Segundo, Calif.
EVALUATION OF NOISE CONTROL TECHNOLOGY AND ALTERNATIVE NOISE CERTIFICATION PROCEDURES FOR PROPELLER-DRIVEN SMALL AIRPLANES Final Report
David Brown and Louis C. Sutherland Washington FAA May 1982 224 p refs
(Contract DTFA01-80-C-10133)
(AD-A116495; FAA/EE-82-14; WR-82-4) Avail: NTIS HC A10/MF A01 CSCL 20/1

This report considers the effectiveness of current noise regulations in Appendix F of FAR Part 36, examines the potential effectiveness of future technology to achieve further noise reduction, and evaluates a number of new concepts for noise certification procedures for propeller-driven small aircraft. The latter were based, in part, on results of a flight test program carried out with Cessna Aircraft Company, to evaluate the utility of takeoff noise tests and the possible use of sound exposure level as a suitable metric for noise certification of the subject aircraft. The study indicates that existing regulations have been effective in stimulating development of quieter propellers for the existing fleet of propeller-driven small aircraft. However, it does not appear economically feasible to achieve more noise reduction in most of this fleet using existing technology with the possible exceptions of some of the two-engine aircraft. However, application of future noise reduction technology, primarily for quieter propellers, should allow a reduction in current noise limits by about 6 dB and should reduce levels of the noisiest aircraft in the current fleet by as much as 10 dB. A takeoff test is appropriate for all propeller aircraft except those equipped with cruise-optimized fixed-pitch propellers. For this test, the current level flyover test appears to represent the noisiest operating condition. GRA

N82-33152# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK, VOLUME 154
Thomas H. Rau May 1982 18 p
(AF Proj. 7231)
(AD-A116146; AMRL-TR-75-50-Vol-154) Avail: NTIS HC A02/MF A01 CSCL 01/2

The E-4B is a Boeing 747 aircraft modified to serve as the national emergency/HQ Strategic Air Command Airborne Command Post. This report provides measured data defining the bioacoustic environments at flight crew/passenger locations inside this aircraft during normal flight operations. Data are reported for 24 locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Refer to Volume 1 of

this handbook, 'USAF Bioenvironmental Noise Data Handbook, Vol. 1: Organization, Content and Application', AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. Author

N82-33153# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 149: C-9A IN-FLIGHT CREW/PASSENGER NOISE
Thomas H. Rau May 1982 28 p ref
(AF Proj. 7231)
(AD-A116145; AMRL-TR-75-50-Vol-149) Avail: NTIS HC A03/MF A01 CSCL 01/2

The C-9A is a McDonnell Douglas DC-9 series 30 commercial transport modified to perform aeromedical evacuation missions. This report provides measured data defining the bioacoustic environments at flight crew/passenger locations inside this aircraft during normal flight operations. Data are reported for 56 locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. GRA

N82-33154# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 161: A/M32A-86 GENERATOR SET, DIESEL ENGINE DRIVEN
Thomas H. Rau May 1982 157 p refs
(AD-A116147; AMRL-TR-75-50-Vol-161) Avail: NTIS HC A08/MF A01 CSCL 01/2

The A/M32A-86 generator set is a diesel engine driven source of electrical power used for the starting of aircraft, and for ground maintenance. This report provides measured and extrapolated data defining the bioacoustic environments produced by this unit operating outdoors on a concrete apron at normal rated/loaded conditions. Near-field data are reported for 37 locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 36 locations are normalized to standard meteorological conditions and extrapolated from 10 - 1600 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. GRA

N82-33155# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 162: MD-4MO GENERATOR SET
Thomas H. Rau May 1982 18 p refs
(AD-A116148; AMRL-TR-75-50-Vol-162) Avail: NTIS HC A02/MF A01 CSCL 01/2

The MD-4MO generator set is an electric motor-driven source of electrical power used primarily for the starting of aircraft, and for ground maintenance. This report provides measured and extrapolated data defining the bioacoustic environments produced by this unit operating outdoors on a concrete apron at a normal rated condition. Near-field data are reported for 37 locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference levels, perceived noise levels, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. GRA

N82-33156# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 163: GPC-28 COMPRESSOR
Thomas H. Rau May 1982 53 p refs
(AD-A116149; AMRL-TR-75-50-Vol-163) Avail: NTIS HC A04/MF A01 CSCL 01/2

The GPC-28 is a gasoline engine-driven compressor with a 120 volt 60 Hz generator used for general purpose maintenance. This report provides measured and extrapolated data defining the bioacoustic environments produced by this unit operating outdoors on a concrete apron at a normal rated condition. Near-field data are reported for 37 locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 36 locations are normalized to standard meteorological conditions and extrapolated from 10 - 1600 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. GRA

N82-33157# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
UDAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 164: MD-1 HEATER, DUCT TYPE, PORTABLE
Thomas H. Rau May 1982 18 p refs
(AD-A116150; AMRL-TR-75-50-Vol-164) Avail: NTIS HC A02/MF A01 CSCL 01/2

The MD-1 heater is an electric motor-driven, portable ground heater used primarily for cockpit and cabin temperature control. This report provides measured and extrapolated data defining the bioacoustic environments produced by this unit operating outdoors on a concrete apron at normal rated conditions. Near-field data are reported for 37 locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise levels, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. GRA

N82-33158# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 165: MC-1 HEATER, DUCT TYPE, PORTABLE
Thomas H. Rau Jun. 1982 53 p ref
(AF Proj. 7231)
(AD-A116151; AMRL-TR-75-50-Vol-165) Avail: NTIS HC A04/MF A01 CSCL 01/2

The MC-1 heater is a gasoline-motor driven, portable ground heater used primarily for cockpit and cabin temperature control. This report provides measured and extrapolated data defining the bioacoustic environments produced by this unit operating outdoors on a concrete apron at normal rated conditions. Near-field data are reported for 37 locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise levels, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 36 locations are normalized to standard meteorological conditions and extrapolated from 10 1600 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. GRA

N82-33159# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 167: MA-3M AIR CONDITIONER
Thomas H. Rau Jun. 1982 18 p ref
(AF Proj. 7231)
(AD-A116152; AMRL-TR-75-50-Vol-167) Avail: NTIS HC A02/MF A01 CSCL 01/2

The MA-3M is an electric motor-driven air conditioner designed to cool electronic equipment on aircraft during ground maintenance. This report provides measured and extrapolated data defining the

bioacoustic environments produced by this unit operating at a normal rated condition. Near-field data are reported for 37 locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference levels, perceived noise levels, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. GRA

N82-33160# Texas Univ., Austin. Applied Research Labs.
ACOUSTIC REFLECTION FROM ANISOTROPIC SEDIMENTS
David W. Oakley 1 Jun. 1982 88 p refs
(Contract N00014-80-C-0490)
(AD-A116399; ARL-TR-82-28) Avail: NTIS HC A05/MF A01 CSCL 20/1

Measurements of an excess of horizontal to vertical velocity (averaging 10% for shales), have been made in marine sediments and in sedimentary rocks. In this paper, the proposed causes of such anisotropies are reviewed, and the reflection coefficient for incidence from water onto a solid sea floor is derived for plane wave solutions of the anisotropic wave equations. The possibility of backward traveling fronts of pressure amplitude at low grazing angles is noted. A propagation matrix formation is established to generalize the reflection coefficient for the case of multiple layers. Bottom loss calculations are made which suggest that anisotropy can increase the reflectivity of the ocean floor. Author (GRA)

N82-33161# National Bureau of Standards, Washington, D.C. National Engineering Lab.
ULTRASONIC RESEARCH AND LITERATURE GUIDE TO THE NATIONAL BUREAU OF STANDARDS/OFFICE OF NAVAL RESEARCH PROGRAM Summary Report
F. R. Breckenridge, M. Greenspan, and D. G. Eitzen Jun. 1982 11 p refs
(Contract N00014-82-F-0004)
(AD-A116255; NBSIR-82-2529) Avail: NTIS HC A02/MF A01 CSCL 20/1

This brief report summarizes research efforts in physical acoustics at the National Bureau of Standards (NBS) which were partially supported by the Office of Naval Research (ONR). It summarizes what we think are many of the major accomplishments at NBS in the area of physical acoustics from 1948 to 1981. The published literature documenting these successes is listed. Author (GRA)

N82-33162# PEER Consultants, Inc., Rockville, Md.
EXECUTIVE SUMMARY OF SYSTEMS ANALYSIS TO DEVELOP FUTURE CIVIL AIRCRAFT NOISE REDUCTION ALTERNATIVES Final Report
Lilia Abron Robinson Washington FAA May 1982 75 p
(Contract DTFA01-81-Y-10574)
(AD-A116467; FAA-EE-82-3) Avail: NTIS HC A04/MF A01 CSCL 01/3

This executive summary contains the results of the study 'System Analysis to Develop Future Civil Aircraft Noise Reduction Alternatives' performed by Wyle Laboratories under contract no. DOT-FA77-WA 3900 (July 1980). The original study first developed and examined a set of projected scenarios of U.S. carrier aircraft fleet compositions for three planning years: 1980, 1990, and 2000 (hereinafter referred to as the planning years). An analysis of the costs and benefits of alternative methods of achieving noise reductions around airports was then made, based on information available in 1979. Forecasts may not necessarily represent present (October 1981) situations. The study involved six specific technical areas, for which separate volumes were prepared: Volume 1 - Aircraft Classification Specification, Volume 2 - Aircraft Certification, Volume 3 - Technology Assessment, Volume 4 - Definition of Flight Path Options, Volume 5 Land Use Options, and Volume VI - Cost/Benefit Analysis. Due to the large amount of data collected for the study, the FAA determined that it would not be economically feasible to publish such a voluminous report. Author (GRA)

N82-33163# Air Force Medical Center, Wright-Patterson AFB, Ohio. Aerospace Medical Research Lab.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 168: MB-3 TESTER, PRESSURIZED CABIN LEAKAGE, AIRCRAFT
Thomas H. Rau Jun. 1982 18 p
(AF Proj. 7231)
(AD-A116153; AMEL-TR-75-50-Vol-168) Avail: NTIS HC A02/MF A01 CSCL 01/2

The MB-3 Tester is an electric motor-driven cabin leakage tester designed to furnish pressurized air to the aircraft at controlled pressures and temperatures during ground pressurization of aircraft cockpits and pressurized compartments. This report provides measured data defining the bioacoustic environments produced by this unit operating at a normal rated/load condition. Near-field data are reported for 37 locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. GRA

N82-33164# Dayton Univ., Ohio. School of Engineering.
SOUND TRANSMISSION THROUGH DUCTS AND AIRCRAFT NOISE PREDICTION, VOLUME 1 Final Report, 15 May 1978 - 15 May 1981
John J. Schauer, John T. Datko, and Robert W. Guyton Wright-Patterson AFB, Ohio AFWAL Jan. 1982 55 p refs
(Contract F33615-78-C-2016; AF Proj. 3066)
(AD-A115783; UDR-TR-81-118-Vol-1; AFWAL-TR-81-2131-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 20/1

Aircraft engine acoustical lining impedance models, ray acoustics, hydrodynamic modes, and transient analysis of sound propagation in variable area duct studies were applied to aircraft noise prediction. The effects of several duct lining configurations in a TF33 P5 and a CFM56 engined KC-135B aircraft were predicted. The prediction was based on a model corrected to fit flight noise data and modified by including theoretical duct noise attenuation predictions. The transient solution of variable area ducts permitted the prediction of sound propgation in bullet nose inlets for no low and was moderately successful when a potential flow was included with low Mach numbers. Volume 1 contains the technical report and analysis. Volume 2 contains the user's manuals and listings of the computer codes developed. Author (GRA)

N82-33165# SACLANT ASW Research Center, La Spezia (Italy). Underwater Research Div.
CONSISTENCY TESTS OF ACOUSTIC PROPAGATION MODELS
Finn B. Jensen and William A. Kuperman 1 Mar. 1982 35 p refs
(AD-A115666; SACLANTCEN-MR-SM-157) Avail: NTIS HC A03/MF A01 CSCL 20/1

Three wave-theory models (NM, FFP, PE) and one ray model are applied to four different ocean environments: a range-dependent surface duct, a deep-water environment with a homogeneous bottom, a shallow-water environment with a homogeneous bottom, and a sloping-bottom environment with a layered bottom. The consistency among the acoustic models is clearly demonstrated through the agreement between model results for the various test problems. GRA

N82-33166# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
INTERFEROMETRIC DETECTION OF ULTRASOUND Final Report, 1 Sep. 1980 - 1 Jul. 1981
Michael J. Rudd 1 Jul. 1981 39 p refs
(Contract N62269-80-C-0260)
(AD-A115930; BBN-4699; NADC-79009-60) Avail: NTIS HC A03/MF A01 CSCL 20/1

This report describes the development of an interferometer to measure ultrasonic surface vibrations. The output from a low power helium-neon laser was focused onto the surface to be measured, and the phase of the reflected light was measured. The type of interferometer used was an Optical Heterodyne Interferometer, in which the frequency of the reference beam was shifted by 40 MHz

and a phased-locked loop was built to track the 40 MHz signal. The sensitivity, frequency response, and pulse response were measured and compared with those from a PZT transducer. The effects of different surface finishes were also studied, and the sensitivity was compared with theoretical values. The actual sensitivity was 15A on a 10 Mhz bandwidth, and 0.02A on a 1 Hz bandwidth. Finally, suggestions are made to improve the sensitivity still further. GRA

N82-33167# Wyle Labs., Inc., El Segundo, Calif.
EFFECTS OF FILTER RESPONSE ON ANALYSIS OF AIRCRAFT NOISE DATA Final Report
Louis C. Sutherland Washington FAA May 1982 83 p refs Prepared for Peer Consultants, Inc.
(Contract DTFA-81-Y-10574)
(AD-A116458; FAA-EE-82-2; WR-81-59) Avail: NTIS HC A05/MF A01 CSCL 17/9

This report analyzes the effects of non-ideal filter transmission characteristics upon the measurement, correction, or extrapolation of aircraft noise dat a. The report is based primarily upon, and represents an abbreviated summary of, two previously published, more detailed reports on this topic. The basic approach used to correct aircraft spectra for analysis errors due to finite filter sidebands and signal spectrum slopes involves defining same type of approximation to the true spectrum shape of all frequencies. The closer this approximation is to the true spectrum slope, the more accurate the correction for filter effects. This report reviews several such filter effect correction methods of varying degrees of accuracy. Measurements on the ground of noise from aircraft in flight can involve propagation distances of the order of 300 to 2,000 m or more. In this case, band levels at high frequencies can be substantially in error, by more than 10 dB, unless filter effects are considered. However, it is also shown that while the band levels may be subject to large errors due to filter effects , errors in composite noise levels such as PNL, LA or EPNL will usually be small - less than 1 dB. GRA

N82-33168# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Biodynamic Environment Branch.
USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK. VOLUME 158: F-106A AIRCRAFT, NEAR AND FAR-FIELD NOISE
Thomas H. Rau May 1982 133 p ref
(AF Proj. 7231)
(AD-A116930; AMRL-TR-75-50-Vol-158) Avail: NTIS HC A07/MF A01 CSCL 01/2

The USAF F-106A is a single seat, all-weather fighter/interceptor aircraft powered by a J75-P-17 turbojet engine. This report provides measured and extrapolated data defining the bioacoustic environments produced by this aircraft operating on a concrete runup pad for five engine-power conditions. Near-field data are reported for five locations in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise levels, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 19 locations are normalized to standard meteorological conditions and extrapolated from 75 - 8000 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. GRA

N82-33169# Centre Technique des Industries Mecaniques, Senlis (France).
DIRECT MEASUREMENT OF ACOUSTIC INTENSITY: ENERGY FLUX NEAR A POINT SOURCE ABOVE A REFLECTING PLANE Final Report [LA MESURE DIRECTE DE L'INTENSITE ACOUSTIQUE. FLUX D'ENERGIE PROCHE D'UNE SOURCE PONCTUELLE AU-DESSUS D'UN PLAN]
M. Bockhoff and A. BadieCassagnet Dec. 1980 42 p refs In FRENCH
(CETIM-11-H-09-0) Avail: NTIS HC A03/MF A01

The acoustic pressure and intensity fields of a point source above a perfectly reflecting plane are compared. In order to determine the acoustic power of a sound source, the acoustic pressure on a surface which covers the source is measured. The different sources of error which are associated with this method are recalled. Only interference phenomena between direct waves from the sound source and reflected waves off the plane which intensify acoustic pressure at certain places while diminishing it at others are treated. The problem of spherical wave reflection and wave propagation in semi-infinite space near a plane is posed in general form. Analysis of the scalar pressure field is reviewed. An analysis of the vectorial intensity field is proposed, which is made possible and verified by recently developed methods of direct intensity measurement. Author (ESA)

N82-33170# Centre Technique des Industries Mecaniques, Senlis (France).
NOISE MEASUREMENT IN GEARDOWN MECHANISMS: COMPARATIVE STUDY OF NOISE MEASUREMENT TECHNIQUES FOR REDUCTION BOXES [MESURE DU BRUIT DES REDUCTEURS A ENGRENAGES (ETUDE COMPARATIVE DES TECHNIQUES DE MESURE DU BRUIT DES REDUCTEURS)]
Yves Burembaut and J. C. Romani Dec. 1981 73 p In FRENCH
(CETIM-11-H-45-6X; REPT-1) Avail: NTIS HC A04/MF A01

Two noise measurement techniques were defined and tested. First, the radiated acoustic power was determined by finding the normal component of the acoustic intensity vector at the surface that encloses a reduction box (near field). Second, the radiating acoustic power was established by measuring the vibration frequency at a certain number of points, directly on a reduction box surface. Measurements were conducted in the laboratory and in an anechoic chamber. The acoustic power spectra obtained with the two techniques were compared in order to derive the radiation coefficient (the relation between radiated acoustic power and radiating acoustic power). The results agree with those found in the literature. Author (ESA)

N82-33171# Centre Technique des Industries Mecaniques, Senlis (France).
DIRECT MEASUREMENT OF ACOUSTIC INTENSITY: APPLICATION TO THE IDENTIFICATION OF PRESSURE PULSE SOURCES IN DUCTS [LA MESURE DIRECTE DE L'INTENSITE ACOUSTIQUE. APPLICATION A L'IDENTIFICATION DES SOURCES DE PULSATIONS DE PRESSION DANS LES CIRCUITS]
A. BadieCassagnet, M. Bockhoff, and J. M. Lambert Oct. 1981 47 p refs In FRENCH
(CETIM-11-H-090) Avail: NTIS HC A03/MF A01

Application of sound intensity measurements in order to study acoustic problems in hydraulic or gas ducts was investigated. Theory demonstrates that it is possible to completely characterize a quasi-stationary plane wave in a duct. The acoustic pressure at two points in a duct and the phase difference between the two signals are measured. For broadband noise, the phase difference is found by simultaneous determination of the Fourier transforms of the pressure signals. With these three values, (a) a measure of the vector intensity which characterizes the global energy flux in a section and especially its direction, (b) the progressive wave rate that is the root of the relation between the pressure minima and maxima, and (c) the distance between the measurement point and the reflector which is the cause of the quasi-stationary wave are obtained. Experiments with pure tones and broadband noise in a Kundt tube and in two hydraulic circuits of different dimensions confirm the method. Author (ESA)

N82-33172# European Space Agency, Paris (France).
ACOUSTIC SIMILARITY LAWS FOR CENTRIFUGAL FANS
Wolfgang Neise and Bernd Barsikow Feb. 1982 56 p refs Transl. into ENGLISH OF "Akustische Aehnlichkeitsgesetze bei Radialventilatoren" rept. DFVLR-FB-80-36 DFVLR, Berlin, Aug. 1980 6 p
(ESA-TT-712; DFVLR-FB-80-36) Avail: NTIS HC A04/MF A01; original German version available from DFVLR, Cologne DM

10,50

Acoustic similarity laws for fans were experimentally verified. Three, dimensionally similar centrifugal fans of 140, 280, and 560 mm impeller diameter were used. The fans were connected to anechoically terminated discharge ducts. It is shown that the influence of the Reynolds number on the radiated sound pressure is negligible within 140,000 < or = Reynolds number < or = 2,200,000 which is the range covered by the measurements. This result is in agreement with earlier studies in which the Reynolds number was varied from 14,000 to 450,000. Experimental results support the conclusion that fan noise data which is taken on model fans can be extrapolated to other dimensionally similar fans of different size for arbitrary fan speeds and working fluids, provided that the operating condition and the measurement position are the same. Author (ESA)

N82-33173# European Space Agency, Paris (France).
NOISE REDUCTION IN CENTRIFUGAL FANS BY THE USE OF LAMBDA/4 RESONATORS
Wolfgang Neise and Gary H. Koopmann (Houston Univ., Tex.) Mar. 1982 64 p refs Transl. into ENGLISH of "Geraeuschminderung bei Radialventilatoren durch lambda/4-Resonatoren" rept. DFVLR-FB-81-09 DFVLR, Goettingen, West Ger., Mar. 1981 52 p
(ESA-TT-723; DFVLR-FB-81-09) Avail: NTIS HC A04/MF A01; original German version available from DFVLR, Cologne DM 9,20

Aerodynamic blade passage noise reduction, using a resonator at the cutoff of a centrifugal fan, is described. While preserving the original cutoff geometry, the perforated mouth of the resonator forms the new cutoff. The resonator can be tuned to various frequencies, e.g., the blade passing frequency, via a movable end plug, enabling tone intensity to be reduced by up to 29 dB. Attenuation of a lesser degree occurs within a frequency band around the resonance frequency. The bandwidth of the resonator response is influenced by the porosity of the resonator mouth. Substantial noise reductions are observed in inlet and outlet ducts over a wide range of aerodynamic loading conditions. The volume flow pumped through a given duct system is changed by less than 1% when the resonator is used. Author (ESA)

N82-33174# Centre Technique des Industries Mecaniques, Senlis (France).
IMPROVING THE DESIGN AND CHARACTERISTICS OF ACOUSTIC TRANSDUCERS Final Report [AMELIORATION DE LA CONCEPTION ET DE L'UTILISATION DES CAPTEURS D'EMISSION ACOUSTIQUE]
J. Roget Jun. 1981 33 p refs In FRENCH
(CETIM-15-Y-041) Avail: NTIS HC A03/MF A01

The design of piezoelectric transducers was studied by comparing commercial ceramics, computing the resonance frequency, and studying electronic devices which use them. Nonpiezoelectric transducers were also studied, including an experimental condenser transducer and a commercial electret transducer. It is shown that piezoelectric transducers are the best adapted to detecting acoustic emission. Capacitive pickups can be used where frequency selectivity is a problem. Author (ESA)

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N82-33175# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Physics.
CALCULATIONS OF SURFACE BINDING AND MOBILITY OF ADATOMS Final Report, 15 Feb. 1978 - 15 Mar. 1982
H. B. Huntington 23 Jun. 1982 11 p refs
(Contract DAAG29-80-C-0130; Grant DAAG29-78-G-0065)
(AD-A116445; ARO-14766.3-MS) Avail: NTIS HC A02/MF A01 CSCL 12/1

Theoretical calculations are developed to explore the behavior of adatoms on the surfaces of a simple metal. The first application was to an adatom (pseudo potential plus valence electron) on a jellium model of a free electron type metal. The density functional approximation was used to evaluate the binding energy as a function of adatom-surface distance. Next a layer of surface ions was introduced and the adatom surface binding energy determined as a function of position over the surface, thereby evaluating the energy for surface migration. Finally the influence of one layer steps, or ledges, on an otherwise smooth surface, were explored and the size of the binding energy for adatoms at a ledge was evaluated. Author (GRA)

N82-33176# McDonnell-Douglas Research Labs., St. Louis, Mo. Chemical Physics Dept.
MAGNETIC RESONANCE DETERMINATIONS OF STRUCTURE AND REACTION KINETICS OF EPOXY/AMINE SYSTEMS Final Report, 1 Oct. 1980 - 31 Dec. 1981
I. M. Brown, A. C. Lind, and T. C. Sandreczki 31 Dec. 1981 104 p refs
(Contract N00019-80-C-0552)
(AD-A116542; MDC-Q0759) Avail: NTIS HC A06/MF A01 CSCL 07/4

Electron paramagnetic resonance (EPR) and nuclear magnetic resonance (NMR) were used to investigate (1) the kinetics of the reactions between amines and epoxies using model compounds and (2) the microstructure present in amine-cured epoxies. The cured resins were studied close to the glass transition as a function of temperature and as a function of solvent content (Methylene chloride). GRA

N82-33177# Air Force Geophysics Lab., Hanscom AFB, Mass. Aeronomy Div.
EJECTION OF PARTICLES FROM A CHARGED INFINITE STRIP Interim Scientific Report
Christopher Sherman and Patricia Bench 1 Feb. 1982 20 p refs
(AF Proj. 7661)
(AD-A115223; AFGL-TR-82-0037; ERP-769) Avail: NTIS HC A02/MF A01 CSCL 20/8

Trajectories of charged particles emitted from an infinite strip at a fixed potential with respect to and embedded in a unipotential ambient plane are calculated. Separation curves that divide emitted particles into those that escape from the emission plane and those that return to it are obtained. Results are compared with trajectories calculated in a previously studied, simpler model. Asymptotic properties are examined. The case of particles emitted from an embedded circular disk is discussed. Author

N82-33178# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.
COOLED ION FREQUENCY STANDARD Annual Summary Report, Oct. 1981 - Sep. 1982
D. J. Wineland and F. L. Walls 25 Jun. 1982 10 p refs
(Contract N00014-82-F-0003; NR Proj. 407-004)
(AD-A116042) Avail: NTIS HC A02/MF A01 CSCL 20/8

The purpose of this work is to develop techniques to overcome the fundamental limits of present frequency standards--the second and residual first-order Doppler shifts. To this end we study suitable frequency reference transitions in ions which are stored on electromagnetic traps and cooled by radiation pressure to < 1K. Author (GRA)

N82-33179# National Bureau of Standards, Boulder, Colo. Quantum Physics Div.
ELECTRON EXCITATION OF O2 METASTABLES IN O2-N2 MIXTURES AND OF FREE-FREE RADIATION IN ARGON Final Report, Oct. 1980 - Sep. 1981
C. Yamabe and A. V. Phelps Wright-Patterson AFB, Ohio AFWAL May 1982 40 p refs
(Contract MIPR-FY1455-81-00605; AF Proj. 2301)
(AD-A115818; AFWAL-TR-82-2016) Avail: NTIS HC A03/MF A01 CSCL 20/7

Measurements have been made of electron excitation coefficients for the production of O2(a(1)delta) metastables in mixtures

of O2 and N2 for a range of mixture ratios and mean electron energies. The results are in agreement with calculations using the best available electron collision cross sections sets provided proper allowance is made for cascading from high excited states. Measurements have been made of coefficients for the production of free-free photons (Bremsstrahlung) as a result of the collisions of electrons with argon atoms. These measurements were made under the carefully controlled conditions of the electron drift tube. The mean electron energy was varied from 1.4 to 4.2 eV and the wavelength was varied from 500 nm to 1.3 nm. The results are in agreement with theory to within the experimental uncertainty of + or - 20%. GRA

N82-33180# California Univ., San Diego, La Jolla. Dept. of Chemistry.

MOLECULAR MECHANICS WITH AN ARRAY PROCESSOR

Peter H. Berens and Kent R. Wilson Jun. 1982 32 p refs Submitted for publication

(Contract N00014-78-C-0325)

(AD-A117070; TR-8) Avail: NTIS HC A03/MF A01 CSCL 07/4

In recent years molecular mechanics, the computer simulation of molecular systems using molecular dynamics, Monte Carlo, and energy minimization, has emerged as a powerful tool for investigating and understanding chemical properties and processes. In this paper we discuss a particular solution to the computational needs of molecular mechanics, the use of specialized hardware, a high speed array processor, in our case a Floating Point Systems, Inc. AP-120B. In other papers, we have also discussed an alternative solution, the division of the problem among an array of different processors operating in parallel. Yet a third solution is to use a vector processing machine such as a Cray-1. We will focus here primarily on molecular dynamics within the array processor program package for molecular mechanics we have developed, called Newton. In section II we examine the architecture of the AP-120B. In section III we lay out the specifics of the structure of the program package we have developed for molecular dynamics. Finally, in section IV we present the results, analyze potential array processor improvements, and point out the advantages and importance of the environment in terms of language and operating system. GRA

N82-33181*# California Univ., San Diego, La Jolla. Dept. of Chemistry.

PICOSECOND DYNAMICS OF I2 PHOTODISSOCIATION

P. Bado, P. H. Berens, J. P. Bergsma, S. B. Wilson, K. R. Wilson, E. J. Heller (LASL, N. Mex.), K. Eisenthal, ed., R. Hochstrasser, ed., W. Kaiser, ed., and A. Laubereau, ed. Jun. 1982 12 p refs Submitted for publication Sponsored in part by NASA, NSF, NIH and Fonds National Suisse

(Contract N00014-78-C-0325)

(NASA-CR-169223; NAS 1.26:169223; AD-A117077; TR-7) Avail: NTIS HC A02/MF A01 CSCL 07/5

A combination of theoretical molecular dynamics and experimental picosecond spectral measurement is discussed and illustrated for I2 photodissocation which can potentially answer one of the fundamental unresolved questions of chemistry, how, from a microscopic viewpoint, solutions reactions take place.

Author (GRA)

N82-33182# Stevens Inst. of Tech., Hoboken, N. J. Dept. of Materials and Metallurgical Engineering.

STUDIES OF MAGNETISM AND EXCHANGE SCATTERING IN SOLIDS USING SYNCHROTRON RADIATION AND SPIN-POLARIZED PHOTOEMISSION Progress Report, 1 Jun. 1981 - 31 May 1982

Gerald M. Rothberg Jan. 1982 8 p refs

(Contract DE-AC02-81ER-10908)

(DE82-011522; DOE/ER-10908-1) Avail: NTIS HC A02/MF A01

Most of the equipment needed to investigate Spin Polarized EXAFS (SPEXAFS) New techniques to study magnetic order and spin dependence of electron scattering in solids by photoemission are investigated. The spin dependence of extended X-ray absorption fine structure is used for investigation of short range magnetic structure about the absorber atom, in which synchroton radiation is applied. DOE

N82-33183# Paris Univ., Orsay (France). Inst. de Physique Nucleaire.

HIGH-ENERGY ANTIDEUTERON-NUCLEUS COLLISIONS. ANNIHILATION CROSS SECTION

J. Formanek (Charles Univ., Prague) Jan. 1981 17 p refs

(DE81-700830; IPNO-TH-81-10) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The problem of annihilation of fast antideuterons in complex nuclei is analyzed semi-quantitatively. A simple probabalistic model of the high-energy annihilation is introduced. L.F.M.

N82-33184# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Angewandte Kernphysik.

METHOD FOR ANALYSIS OF INELASTIC ALPHA PARTICLE SCATTERING

H. Rebel, R. Pesl, H. J. Gils, and E. Friedmann (Hebrew Univ. of Jerusalem) May 1981 20 p refs In ENGLISH; GERMAN summary

(DE82-780167; KFK-3104; ISSN-0303-4003) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Inelastic scattering of strongly interacting particles from nuclei, which suffers from the model dependence introduced when specifying the form factors (coupling potentials), e.g., in the framework of a vibrational model was analyzed. The relation between strength and shape of the coupling potentials and corresponding quantities of the transition densities is not well established, and transition rates and nuclear moments introduce additional uncertainties. Inelastic scattering of 104 MeV alpha particles from (5) Z)Ti and (52)Cr the constraints are removed due to prechosen forms of the coupling potentials by applying the Fourier-Bessel method. It allows quite general shapes and provides realistic estimates of the uncertainties of the potentials and derived quantities (moments). Rates are derived by using the identities between the integral moments of a folded potential distribution and of the underlying nuclear matter distribution isoscalar transition. DOE

N82-33185# California Univ., Livermore. Lawrence Livermore Lab.

THERMALIZATION OF HEAVY-ION BEAMS IN THE FINAL LENS OF VACUUM REACTOR VESSELS

W. A. Barletta 26 Oct. 1981 16 p refs Presented at the 9th Symp. on Eng. Problems of Fusion Res., Chicago, 26-29 Oct. 1981

(Contract W-7405-eng-48)

(DE82-002577; UCRL-86016; CONF-811040-69) Avail: NTIS HC A02/MF A01

During final ballistic transport of heavy ion beams through vacuum and near vacuum reactor chambers, anharmonic space charge forces will distort the phase space of the beams. This distortion leads to the growth of macroscopic beam emittance. Consequently the size of the final focal spot at the pellet is increased. The magnitude of the anharmonic forces depends upon the roundness of the beam current density radial profile. The expansion of the beam was found to lead to a growth of the rms emittance in the form of an ordered velocity field. Consideration of this effect sets limits on the applicability of the cold, converging beam mode of ballistic transport. DOE

N82-33186# Paris Univ., Orsay (France). Inst. de Physique Nucleaire.

ABOUT THE EXPERIMENTAL INVESTIGATION OF NUCLEAR DEFORMATION AT VERY HIGH ANGULAR MOMENTUM

C. Roulet 1980 17 p refs Presented at the 18th Intern. Winter Meeting on Nucl. Phys., Bormio, Italy, 21 Jan. 1980

(IPNO-PhN-80-04; CONF-800139-7) Avail: NTIS HC A02/MF A01

A total X-ray energy spectrometer was used to select angular momentum windows in the decay pattern of compound nuclei. Various kinds of counters were used in coincidence with the big

crystal such as single small NaI detectors of Ge(Li) counters. An average angular momentum together with an affective moment of inertia are derived versus the total X-ray energy. A variety of nuclei were investigated with the aim to follow the nuclear behavior and try to determine the nuclear shapes up to very high spins. Residual nuclei in the vicinity of Er160, Yb166 and Nd136 exhibit a fairly constant effective moment of inertia close to the rigid body value over a wide range of angular momentum. On the other hand, to tellurium isotopes around A = 118 which behave like vibrators at low spins, corresponds an effective moment of inertia which increases rather quickly with the angular momentum towards the rigid body value. No clear evidence of extreme nuclear deformations such as probate shapes with a ratio of principal axis of 2 to 1 was observed so far within the experimental uncertainties for the nuclei which were studied. DOE

N82-33187# Bordeaux Univ. (France). Centre d'Etudes Nucleaires.

SECONDARY REACTIONS AS A TOOL TO PRODUCE EXOTIC NUCLEI

J. P. Dufour, A. Fleury, and R. Bimbot (Inst. de Physique Nucleaire, Orsay, France) 1980 18 p refs

(CENBG-8007) Avail: NTIS (US Sales Only) HC 02/MF A01; DOE Depository Libraries

The possibility of using secondary reactions as tool to produce a new isotopes is considered. This question is renewed with the emergence of intense beams of energetic heavy ions in the range of 20 to 100 MeV/nucleon. Three different methods are considered. They involve either the 'in situ' production of a secondary radioactive target, which interacts with the primary beam, or the production of a radioactive secondary beam by an inverse fusion or a fragmentation process. Very heavy or very neutron deficient isotopes can be produced by these methods. DOE

N82-33188# Commissariat a l'Energie Atomique, Bruyeres-le-Chatel (France).

FAST NEUTRON SCATTERING CROSS-SECTIONS FOR ACTINIDE NUCLEI IN THE ENERGY RANGE 0.6 TO 3.4 MeV

Gerard Haouat, Jean Lachkar, Yves Patin, and Jean Sigaud Apr. 1981 11 p refs In FRENCH

(DE81-903967; CEA-N-2197; INDC(FR)-44/L) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Differential cross sections for neutron elastic and inelastic scattering from 232Th, 233U, 235U, 238U, 239Pu, and242Pu were measured at incident energies ranging from 0.6 to 3.4 MeV. Comparison of these results with the latest available evaluations show large discrepancies. The data were analyzed in the framework of the direct interaction and compound nucleus formalisms. Optical potential parameters and nuclear deformation parameters deduced from the calculations are discussed. DOE

N82-33189# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Nuclear Problems.

TENSOR POLARIZATION IN THE pd BACKSCATTERING AT INTERMEDIATE ENERGIES

B. Z. Kopeliovich, L. I. Lapidus, and L. Vegh 1980 3 p refs Submitted for publication

(JINR-E-2-80-518) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Tensor polarization of deuterons in the pd backscattering has been calculated by means of the triangle model without free parameters. It has small absolute value in the proton energy interval 400-1000 MeV which is in agreement with the experiment. It is concluded that the triangle model dominates in the isobar region (500-700 MeV). DOE

N82-33190# Melbourne Univ., Parkville (Australia). School of Physics.

A NUCLEON - NUCLEON POTENTIAL

L. Petris 1981 15 p refs

(UM-P-78/78) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A potential is presented which is consistent with the nucleon-nucleon (NN) elastic scattering data up to E sub LAB = 400 MeV and L = 5, and the deteron properties. DOE

N82-33191# Australian National Univ., Canberra. Dept. of Theoretical Physics.

THE INTERACTING BOSON APPROXIMATION AND THE SPECTROSCOPY OF THE EVEN CADMIUM AND TIN ISOTOPES

I. Morrison and R. Smith 1981 43 p refs

(UM-P-80/59) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

Within the framework of the interacting boson approximation the even moss isotopes Cd108 to Cd116 and Sn116 to Sn124 were investigated. Subjects considered were whether a single two-boson interaction can describe the energy, B(E2), quadrupole moment, and some inelastic nucleon scattering systematics of these nuclei. DOE

N82-33192# Melbourne Univ., Parkville (Australia). School of Physics.

ISOSPIN EFFECTS IN PION-NUCLEAR SCATTERING

I. Morrison and K. Amos 1981 19 p refs

(UM-P-80-65) Avail: NTIS HC A02/MF A01

A simple isospin model of inelastic pion nucleus scattering is discussed, and quantitative results compared with recent experiments on light nuclei. DOE

N82-33193# Los Alamos Scientific Lab., N. Mex.

RADIATION QUALITY OF BEAMS OF NEGATIVE PIONS

J. F. Dicello and D. J. Brenner 1981 11 p refs Presented at the Intern. Workshop on Pion and Heavy Ion Radiotherapy: Preclinical and Clinical Studies, Vancouver, British Columbia, Jul. 1981

(Contract W-7405-eng-36)

(DE82-000567; LA-UR-81-2767; CONF-810763-2) Avail: NTIS HC A02/MF A01

As a negative pion stops in tissue, it attaches itself to an adjacent atom to form a mesonic atom. Subsequently, the wave function of the pion interacts with that of the nucleus and the pion is absorbed. Because the energy associated with the rest mass of the pion is greater than the separation energy of the nuclear particles, the nucleus disintegrates (pion star). In tissue, approximately 40 MeV goes into overcoming the binding energies; 20 MeV goes into kinetic energy of charged particles; 80 MeV goes into kinetic energy of neutrons. In cases where biological studies are performed with beams of negative pions, as much as 20% of the total absorbed dose in the treatment volume and about 50% of the high LET dose > 100 keV microns can result from neutrons. The degree of biological response and the variation of that response throughout the treatment volume can be altered by the neutron dose. DOE

N82-33194# California Univ., Livermore. Lawrence Livermore Lab.

THE (n, CHARGED PARTICLE) REACTIONS ON LP-SHELL NUCLIDES AT 14 MeV

R. C. Haight Jun. 1981 4 p refs Presented at the 4th Intern. Symp. on Neutron-Capture Gamma-ray Spectroscopy and Related Topics, Grenoble, France, 7-11 Sep. 1981 Submitted for publication

(Contract W-7405-eng-48)

(DE82-003188; UCRL-86289; CONF-810920-18) Avail: NTIS HC A02/MF A01

The reactions (n,p), (n,d), (n,t) and (n,alpha) of 14 MeV neutrons with 1p shell nuclides are of interest in several areas: they can provide tests of charge symmetry by comparisons with proton induced reactions (on T = O nuclides); they allow study of the complex, often many body decay of excited nuclear states; and they yield information on final state interactions. As part of the program in (n, charged particle) reaction studies, several 1p shell nuclides were investigated: 9Be, 12C, 14N, and 16O at E sub n = 14 MeV. These measurements, made with magnetic quadrupole charged particle spectrometer, provide data with a much higher

signal-to-background than heretofore available. Experimental methods and results are briefly described. DOE

N82-33195# International Atomic Energy Agency, Vienna (Austria). Atomic and Molecular Data Unit.
INTERNATIONAL BULLETIN ON ATOMIC AND MOLECULAR DATA FOR FUSION, NO. 15
K. Katsonis 1981 32 p refs
(INIS-MF-4754(no. 15)) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A bibliography for the most recent data presented in the document is provided. Work in progress is briefly reported. A list of references covering the years 1980 and 191 for all the publications on controlled fusion and plasma physics is presented. DOE

N82-33196# Institute of Nuclear Physics, Krakow (Poland).
MEASUREMENT OF NATURAL RADIOACTIVITY IN CONSTRUCTION MATERIALS WITH SILICON DETECTORS
Martin Wojcik 1981 20 p refs
(INP-1124/PL) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The results of radioactive contamination measurements of the construction materials most commonly used in the process of building the apparatus for low-level counting are discussed. They were obtained using an apparatus for low-level counting with four semiconductor detectors. DOE

N82-33197# Washington State Univ., Pullman.
NATURE AND MECHANISM OF INDUCTION OF MUTATIONS Annual Progress Report, 1 Aug. 1980 - 1 Oct. 1981
R. A. Nilan, A. Kleinhofs, and C. F. Konzak 1 Oct. 1981 11 p refs
(Contract DE-AT06-76EV-72002)
(DE82-001743; DOE/EV-72002/57) Avail: NTIS HC A02/MF A01

New knowledge of the mechanism of mutation induction and the nature of mutations in eukaryotes continues to be developed from experiments involving sodium azide. Azide is a potent mutagen in bacteria and in higher plants but it is weakly mutagenic and not carcinogenic in mammalian systems. It was determined that azide acted through a promutagen or organic metabolite both in barley and bacterial cells. This metabolite was isolated and characterized. During the past year, considerable progress was made in understanding the pathway by which the metabolite is synthesized in barley and bacteria. It can be synthesized in vitro both in bacteria and barley and some additional knowledge of the structure of the metabolite is being revealed through chemical synthesis of the metabolite. Additional information conerning the lack of azide mutagenicity in mammalian cells was developed through the detailed studies of the action of azide and its metabolite from bacteria and barely on sister-chromatid exchanges in mammalian cells. DOE

N82-33198# Washington Univ., Seattle. Dept. of Physics.
SOME SYMMETRIES IN NUCLEI
E. M. Henley Sep. 1981 75 p refs Presented at the Nucl. Theory Summer Workshop, Santa Barbara, Calif., 17-28 Aug. 1981
(Contract DE-AC06-76ER-01388)
(DE82-002151; DOE/ER-01388/875; CONF-810886-1; RLO-1388-875) Avail: NTIS HC A04/MF A01

Internal and space-time symmetries are discussed. The first of the lectures deals with an internal symmetry, or rather two related symmetries called charge independence and charge symmetry. The next two discuss space-time symmetries which also hold approximately, but are broken only by the weak forces; that is, these symmetries hold for both the hadronic and electromagnetic forces. DOE

N82-33199# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
PARITY VIOLATION IN THE FEW-NUCLEON SYSTEMS AS THE QUARK-NUCLEAR EFFECT. 3: CIRCULAR POLARIZATION OF PHOTONS AT RADIATIVE CAPTURE OF THERMAL NEUTRONS BY PROTONS
V. M. Dubovik and I. T. Obukhovskii 1980 15 p refs
(JINR-E-2-80-555) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The advantages of the quark-nuclear approach to the description of parity violation (PV) effects are demonstrated by the example of the np yields d gamma reaction. At small distances nucleons are considered as 3q clusters of 6q states with the configurations S(6) and S(4)p(2). Parity violation is described by the standard electroweak model. With this approach it is possible to explain the PV effect of Lobashov and others in the np yields d gamma reaction. DOE

N82-33200# Paris XI Univ., Orsay (France). Inst. de Physique Nucleaire.
FIRST STUDY OF THE C-14, C-12 REACTION. SELECTIVITY OF THIS REACTION AND THE ENERGY LEVELS
F. Pougheon, M. Bernas, M. Roy-Stephan, C. Detraz, D. Guillemaud, E. Kashy (Michigan State Univ., East Lansing), M. Langevin, F. Naulin, and P. Roussel 1980 29 p refs
(Grant NSF PHY-78-22696)
(IPNO-PhN-80-15) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The first measurements are reported for (14C, 12C) two neutron stripping reactions. Energy spectra up to an excitation energy of 12 MeV were measured at 69 MeV for the 26Mg(14C, 12C) and 28Si(14C, 12C) reactions. A strong selectivity of this reaction is observed. Using this selectivity, the comparison of the spectra suggests J (pi) assignments for several 30Si and 28Mg states. The results from other two neutron stripping reactions, (t,p) and 18O, 16O) are compared with those ot the (14C, 12C) reaction. DOE

N82-33201# Virginia Univ., Charlottesville. Dept. of Physics.
ELECTRON AND PION INTERACTIONS WITH NUCLEI Progress Report, 1 Dec. 1980 - 1 Aug. 1981
J. S. McCarthy 1981 155 p refs
(Contract DE-AS05-78ER-05861)
(DE81-028673; DOE/ER-05861/T1) Avail: NTIS HC A08/MF A01

The analysis of high momentum transfer data on Hc-3, He-4, and A1 from the SLAC experiments is discussed. The data collection on Ca-48 isotope is ompleted. A high spin M8 transition was identified along with some 50 other levels. Analyses of this data is proceeding using microscopic DWBA descriptions of the nucleus The quasi-free scattering form Ca-40 and Ca-48 is completed. The preliminary results confirm earliet measurements on Fe-56; the Coulomb sum rule is substantially reduced from independent particle models. The study of Sr-88 and Y-89 continues with emphasis on the extraction of the single particle distribution of the proton and its effect upon nuclear core polarization. Inelastic electron scattering from H-1, H-2, H-3, He-3 and He-4 began at the present Bates linac and measurements at higher energies (750 GeV) are approved for the recirculated beam. DOE

N82-33202# Institute of Nuclear Physics, Krakow (Poland). Lab. of High Energy Physics.
THE LATERAL CHARACTERISTICS OF SEVERAL ULTRA-HIGH ENERGY PROTON AND HADRON FAMILIES, PART 2
Z. Buja, E. Gladysz, J. Mazurkiewicz, M. Szarska, and L. Zawiejski Feb. 1980 33 p refs
(DE82-700531; INP-1077/PH-Pt-2) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

In a thick lead X-ray film emulsion chamber of the experiment Pamir, eight ultrahigh energy photon and hadron families were detected. They are considered to be almost 'pure' families. The compound lateral characteristics for photon families indicate an existence of two groups of particles which have different average transverse momenta. A quite well visible azimuthal asymmetry in the number and transverse momenta values of produced particles is observed. DOE

N82-33203# Atomic Energy Research Establishment, Harwell (England). Theoretical Physics Div.
HANDBOOK OF INTERATOMIC POTENTIALS. 2: METALS
A. M. Stoneham and Roger Taylor (National Research Council, Ottawa) Aug. 1981 277 p refs
(DE82-700694; AERE-R-10205) Avail: NTIS (US Sales Only) HC A13/MF A01; DOE Depository Libraries

This handbook collects together interatomic potentials for a large number of metals. Most of thhe potentials describe the interactions of host metal atoms with each other, and these, in some cases, may be applied to solid and liquid metals. In addition, there are potentials (1) for a metallic impurity alloyed with the host, (2) for a small number of chemical impurities in the metal (e.g., H and O) for rare gas impurities, notably He. The handbook is intended to be a convenient source of potentials for bulk, surface, and defect calculations, both static and dynamic. DOE

N82-33204# California Univ., Berkeley. Lawrence Berkeley Lab.
SOFT-GLUON EFFECTS IN CHARMED-MESON DECAYS
K. I. Shizuya Jun. 1981 8 p refs Presented at Inst. for Nucl. Study Symp. on Quark and Lepton Phys., Tokyo, 25 Jun. 1981
(Contract W-7405-eng-48)
(DE82-000269; LBL-13222; CONF-8106161-1) Avail: NTIS HC A02/MF A01

In D(0) and F(+) meson decays, QCD effects are expected to activate W exchange processes (quark annihilation processes), which by themselves are strongly suppressed because of helicity mismatch. For example, the D(0) meson, on gluon emission, can flip its spin so that the subsequent weak decay proceeds without helicity suppression. Hard gluon emission from the D(0) meson, evaluated perturbatively, enhances the D(0) dcay rate (by approximately 20%). Soft gluon emission is an equally likely source of enhancement in charmed meson decays, and indeed seems to be the dominant one. This soft gluon effect in charmed meson decays was studied by a nonperturbative method that has theoretical foundations in QCD. The basic tool is a multipole expansion in QCD. The analysis is divided into three steps: virtual color fluctuation of charmed mesons, separation of long distance and short distance phenomena by use of QCD multipole expansion, and evaluation of the soft gluon effect. DOE

N82-33205# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
SCATTERING-THEORETICAL INVESTIGATION OF THE VIBRATIONAL EXCITATION OF ATOMIC MOLECULES AT COLLISION ENERGIES ABOVE 15 eV [STREUTHEORETISCHE UNTERSUCHUNG DER SCHWINGUNGSANREGUNG ZWEIATOMIGER MOLEKUELE BEI STROSSENERGIEN 'ABOVE' 15 eV]
Gerhard Drolshagen Jan. 1982 139 p refs In GERMAN
(MPIS-3/1982; ISSN-0436-1199) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22,85

The collision induced vibrational excitation of atomic molecules was studied. Three-dimensional calculations were made by the quantum mechanic breathing sphere approximation. An extensive systematic calculation of integral vibrationally inelastic scattering cross sections of different collision systems was made using the close coupling method. Feshbach resonances were identified for the system H-ion/CO using model calculations. A rainbow structure was found by calculating differential vibrationally inelastic scattering cross sections for the system Li singly ionized/H2. Author (ESA)

N82-33206# National Bureau of Standards, Washington, D.C. National Measurement Lab.
PROCEEDINGS OF A MEETING ON TRACEABILITY FOR IONIZING RADIATION MEASUREMENTS Final Report
H. Thompson Heaton, II, ed. Feb. 1982 190 p refs Meeting held at Gaithersburg, Md., 8-9 May 1980
(PB82-178146; NBS-SP-609; LC-81-600197) Avail: NTIS HC A09/MF A01 CSCL 18D

General concepts for traceability were presented from several perspectives. The national standards for radiation dosimetry, radioactivity measurements, and neutron measurements were described. Specific programs for achieving traceability to the national standards for radiation measurements in medical, occupational, and environmental applications were summarized. GRA

N82-33207# Oxford Univ. (England). Nuclear Physics Lab.
ON THE TRANSVERSE MOMENTUM DISTRIBUTION OF QUARKS CREATED IN A FLUX TUBE
M. G. Bowler 1981 14 p refs
(PB82-178468; Rept-106/81) Avail: NTIS HC A02/MF A01 CSCL 20H

In the Monte Carlo generation of mesons in jets initiated by quarks or gluons, the transverse momentum distribution of created quarks is usually chosen to be Gaussian. The interpretation of the high meson transverse momentum tail, planar, and three jet events in e(+)e(-) annihilation in terms of hard gluon bremsstrahlung is both qualitatively and quantitatively sensitive to this assumed distribution. The transverse momentum distributions obtained when quarks are created in pairs within a flux tube are estimated. It is concluded that the Gaussian distribution is probably an entirely adequate representation. GRA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N82-33208# Committee on Commerce, Science, and Transportation (U. S. Senate).
NUCLEAR WASTE DISPOSAL, PART 1
Washington GPO 1978 587 p refs Hearings before the Subcomm. on Sci., Technol., and Space and the Subcomm. on Surface Transportation of the Comm. on Com., Sci., and Transportation, 95th Congr., 2nd Sess., 9-10 and 16 Aug. 1978 2 Vol.
(GPO-34-032-Pt-1) Avail: Subcommittee on Science, Technology, and Space

Disposal techniques for radioactive wastes are considered. Performance criteria for an acceptable system of waste disposal are developed and scientific and technical knowledge are assessed to determine if the state of the art permits development of a disposal system that meets such criteria. S.L.

N82-33209# Committee on Commerce, Science, and Transportation (U. S. Senate).
NUCLEAR WASTE DISPOSAL. PART 2: ADDITIONAL MATERIAL
Washington GPO 1978 293 p refs Hearings before the Subcomm. on Sci., Technol., and Space and the Subcomm. on Surface Transportation of the Comm. on Com., Sci., and Transportation, 95th Congr., 2nd Sess., 1978 2 Vol.
(GPO-34-032-Pt-2) Avail: Subcommittee on Science, Technology, and Space

The issues pertaining to the scientific and technological knowledge relevant to the construction, operation, and ultimate sealing and long term safety of an mined geologic repository for radioactive wastes are described. Areas where confidence in the state of knowledge exists and areas where uncertainties and lack of knowledge still exists are identified. Radioactive wastes generated as a result of processes within a fission reactor are considered. S.L.

N82-33210# Westinghouse Hanford Co., Richland, Wash. Engineering Development Lab.
ANALOG COMPENSATION FOR SCANNED-BEAM INTENSITY
R. L. Trantow 1981 8 p Presented at the SPIE Intern. Symp., San Diego, Calif., 24-28 Aug. 1981
(Contract DE-AC14-76FF-02170)
(DE82-000859; HEDL-SA-2376; CONF-810810-27) Avail: NTIS HC A02/MF A01

An analog method was developed for compensating surface reflected light intensity data for predictable and unpredictable variations in incident beam intensity. The compensation is performed in real time by dividing the reflected light intensity by a reference beam intensity which is split from the incident beam. The compensated signal is then a function of surface reflectance which is insensitive to the spatially dependent beam intensity modulations encountered with acousto-optic scanners, as well as to unexpected modulations introduced by laser instability, spatial filter vibration, and dust accumulations in the optical path. Analog circuitry, described as a Reference Compensated, Photodiode Amplifier, was developed to implement this compensation method in rapid beam scanning application. The amplifier has a frequency response which is flat within + or - 0.5 db from dc to .5 MHz, and is capable of correcting the reflected light intensity data. DOE

N82-33211# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
PERFORMANCE AND APPLICATION OF A DOUBLE-CRYSTAL MONOCHROMATOR IN THE ENERGY REGION 800 LESS THAN h NU LESS THAN 4500 eV
Z. Hussain (Petroleum and Minerals Univ., Dhahran, Saudi Arabia), E. Umbach (Technische Univ., Munich), D. A. Shirley, J. Stoehr, and J. Feldhaus (Freie Univ., Berlin) Jul. 1981 54 p refs Presented at the 2nd Natl. Conf. on Synchrotron Radiation Instrumentation, Ithaca, N.Y., 15-17 Jul. 1981 Prepared in cooperation with Stanford Univ.
(Contract W-7405-eng-48)
(DE82-001017; LBL-12729; CONF-810750-9) Avail: NTIS HC A04/MF A01

The performance and application of an ultrahigh vacuum compatible constant deviation double crystal monochromator (JUMBO) in operation is demonstrated. The monochromator can be operated with any of four pairs of crystals interchangeablein situ. An electronic maximum search feedback loop optimizes the intensity of the spatially fixed outgoing beam as the photon energy is scanned. The monochromatic beam is focused onto the sample by a toroidal mirror. Monochromator crystals of beryl(10 anti 10), InSb(11) and Ge(111) were tested in the energy regions 800 to 1540 eV, 1690 to 4000 eV and 1930 to 4500 eV, respectively. The performance of these crystals with regard to the resolution, the intensity, the level of scattered light, and the contribution of higher orders were determined. Various effects arising from a radiation induced temperature gradient in the monochromator crystals are discussed. DOE

N82-33212# Tennessee Technological Univ., Cookeville. Dept. of Physics.
NUCLEAR PHYSICS RESEARCH Progress Report, 1 Aug. 1980 - 31 Mar. 1982
1981 23 p refs
(Contract DE-AS05-80ER-10714)
(DE82-002495; DOE/ER-10714/1) Avail: NTIS HC A02/MF A01

The mechanism of heavy ion formation is investigated. The specific questions addressed were: are some heavy ion combinations, leading to the same excitation energy range in the same compound nucleus, less likely to form resonances than others and, if so, to what extent do they form the same resonances. These questions are studied by forming, over a large range of excitation energies. A number of different heavy ion entrance channels. The compound nucleus, B-11 and Li-7 was chosen since four stable target projectile configurations (C-12 + B-11, C-13 + B-10, Be-9 + N-14, and O-16 + Li-7) + O16 systems are, according to classical calculations, dynamically well matched so that both entrance channels will rech the same entrance channel angular momentum (a similar situation exists for the C-13 + B-10 and Be-9 + N-14 systems). DOE

N82-33213# Carnegie-Mellon Univ., Pittsburgh, Pa.
EXPERIMENTAL HYPERNUCLEAR PHYSICS
B. Bassalleck 1981 10 p refs Presented at TRIUMF Kaon Factory Phys. Workshop, Vancouver, Canada, 10 Aug. 1981
(Contract DE-AS02-76ER-03244)
(DE82-000985; CONF-810869-3; COO-3244-86) Avail: NTIS HC A02/MF A01

Recent experimental results from the study of Lambda and Sigma hypernuclei through the [K(-), pi(+-)] reaction are reviewed. Experiments which are just beginning or being actively prepared are also discussed. In addition, an outlook is given at possible first experiments that could utilize the much higher fluxes of a kaon factory. DOE

N82-33214# Gesellschaft fuer Schwerionenforschung m.b.H., Darmstadt (West Germany).
MULTI-PARTICLE CORRELATION OBSERVABLES IN HIGH ENERGY NUCLEUS-NUCLEUS COLLISIONS
R. Stock Jul. 1981 74 p refs Presented at the 5th High Energy Heavy Ion Study, Berkeley, Calif., 18-22 May 1981 Prepared in cooperation with California Univ., Berkeley, Lawrence Berkeley Lab.
(Contract W-7405-eng-48)
(DE82-001342; LBL-12884; CONF-8105104-8) Avail: NTIS HC A04/MF A01

Global features of exclusively measured events, including number correlations and vector correlations, and hybrid analysis of mesurements of one or two specific fragments like spectator nuclei, high transverse momentum particles, polarization of one particle, etc., are considered. DOE

N82-33215# National Science Foundation, Washington, D. C. Div. of Policy Research and Analysis.
MOBILIZATION OF THE PRIVATE SECTOR IN EFFECTIVE DEVELOPMENT OF FUSION ENERGY: PAPERS FOR AND A SUMMARY OF A WORKSHOP
1981 104 p Workshop held in Washington, D.C., 29-30 Sep. 1980
(PB82-173469; NSF/PRA-81023) Avail: NTIS HC A06/MF A01 CSCL 18A

Four papers and a summary of a workshop on the mobilization of the private sector in developing fusion energy is reported. The workshop is one of a series which assesses Federal policy options relating to the commercialization of selected energy technologies viewed as alternatives to petroleum-derived fuels. The papers focused on the potential roles to be played by fusion energy in the future electric generating industry; current commitments and participation of the private sector in fusion energy development; suggestions for policy incentives to enhance private participation in fusion research; organization, staffing, and operating a center for fusion engineering; the industrial structure and practices in developing and deploying power generating facilities and their implications in relation to fusion energy development; and characteristics required by any new energy-producing technology such as low capital and operating costs and minimal environmental output. Author

N82-33216# Cambridge Univ. (England). Dept. of Engineering.
A REVIEW OF SOME FORMAL METHODS FOR DECISION-MAKING
S. R. Watson and G. M. Hayward 1981 35 p refs Sponsored by Dept. of the Environment
(PB82-176744; CUED/F-CAMS/TR-208-1981; ISSN-0309-765X) Avail: NTIS HC A03/MF A01 CSCL 18H

Formal approaches to decision making which might be useful in the management of radioactive wastes are reviewed. The suitability of three formal approaches to decision making are investigated: cost benefit analysis, outranking methods and decision analysis. Each technique is described and the advantages and limitations are discussed. Finally, advantages and limitations of the techniques are related to the requirements listed. GRA

74 OPTICS

Includes light phenomena.

N82-33217*# General Research Corp., Santa Barbara, Calif.
PRELIMINARY DESIGN NOTES ON A LOW F-NUMBER EMR

D. J. Mihora 13 May 1982 39 p refs
(Contract NAS1-16133)
(NASA-CR-165953; NAS 1.26:165953; CR-3-998) Avail: NTIS HC A03/MF A01 CSCL 20F

Conceptual design studies were completed on a new Electrostatic Membrane Reflector, EMR. This new model incorporates both a preformed, curved membrane reflector and membrane control surface. This improved model is the second step toward a high precision large space antenna that could evantually exhibit a performance in terms of aperture diameter to surface quality exceeding 1,000,000. Design trades indicate that the goal of a low ratio of focal length to aperture diameter (f sub n) can be achieved while operating in a humid sea-level environment. A nominal surface quality of 1.0 mm (RMS) is possible using available off-the-shelf commercial membranes. Both the membrane reflector and control electrode surface are fabricated from 12 gore segments and attached to the available 12 sided, 4.88 m diameter rim. The preferred conceptual design has a f sub n = 1.0. The 4.88 m aperture is performed with a centerline displacement of 0.306 m. The nominal spacing between the membrane reflector and the electrode control surface is 50.8 mm. The centerline membrane displacement from its performed to its tensioned, smooth shape is about 3 mm. The membrane tensioning is achieved by application of an electrostatic pressure of 2.6 N/sq cm and a voltage of about 38 kV. Author

N82-33218*# Colorado Univ., Boulder. Lab. for Atmospheric and Space Physics.
ORBITING SOLAR OBSERVATORY 8 HIGH RESOLUTION ULTRAVIOLET SPECTROMETER EXPERIMENT Final Report
1980 85 p refs Sponsored in part by NASA
(NASA-CR-170433; NAS 1.26:170433) Avail: NTIS HC A05/MF A01 CSCL 20F

Oscillations, physical properties of the solar atmosphere, motions in the quiet solar atmosphere, coronal holes, motions in solar active regions, solar flares, the structure of plage regions, an atlas, and aeronomy are summarized. Photometric sensitivity, scattered light, ghosts, focus and spectral resolution, wavelength drive, photometric sensitivity, and scattered light, are also summarized. Experiments are described according to spacecraft made and experiment type. Some of the most useful data reduction programs are described. Author

N82-33219# Scientific Technology Associates, Inc., Princeton, N.J.
OPTICAL DETECTION SYSTEM MODEL Final Technical Report
E. Stokes Fishburne, Jeanne V. Kuhlman, Frank J. Brickle, and Margaret P. Cundiff Griffiss AFB, N.Y. RADC Apr. 1982 87 p refs
(Contract F30602-80-C-0120)
(AD-A226075; RADC-TR-82-60) Avail: NTIS HC A05/MF A01 CSCL 09/2

An Optical Detection System (ODS) computer code has been developed for the simulation of an electro-optical sensor. The primary emphasis has been devoted to modeling the temporal response of the system to an arbitrary time varying input signal. Input signals comprised of several wavelengths also can be treated. The ODS code consists of the following modules: SOURCE MODULE permits the selection of a number of standard input signals (or the user's signal) as well as white noise and 1/f noise, OPTICS MODULE includes a wide range of optical materials and transmissivities as a function of wavelength as well as an etalon option, MODULATOR MODULE which enables the user to select a hopper, circular variable filter, a Fourier transform spectroscopy, DETECTOR MODULE provides a range of detector materials including wavelength response and temporal response characteristic, PREAMP/AMPLIFIER MODULES enable the user to select a low pass filter, high pass filter, band pass filter, band rejection filter and a set of amplifiers the characteristics of which are expressed in poles and zeroes. Author

N82-33220# Analytic Information Processing, Inc., Danville, Calif.
RESEARCH AND DEVELOPMENT IN SPECKLE IMAGING Final Technical Report, 1 Jan. 1980 - 30 Sep. 1981
James W. Sherman 30 Nov. 1981 170 p refs
(Contract F49620-80-C-0032; AF Proj. 2311)
(AD-A115887; AFOSR-82-0361TR) Avail: NTIS HC A08/MF A01 CSCL 20/6

The progress made for research and development in Speckle Imaging is reviewed. The efforts were concentrated on modelling non-isoplanatic speckle images, developing restoration algorithms for non-isoplanatic conditions, and developing recursive algorithms for image reconstruction. GRA

N82-33221# National Bureau of Standards, Washington, D.C.
OPTICAL PROPERTIES OF MATERIAL FOR THE INFRARED Final Technical Report, 1 Apr. 1978 - 31 Mar. 1982
Albert Feldman May 1982 16 p refs
(Grants AFOSR-ISSA-82-00001; AFOSR-ISSA-81-00006; AFOSR-ISSA-78-0026; AFOSR-ISSA-79-0001; AFOSR-ISSA-80-00002; AF Proj. 2306)
(AD-A115973; AFOSR-82-0496TR) Avail: NTIS HC A02/MF A01 CSCL 20/6

The piezobirefringence of calcium fluoride, barium fluoride, strontium fluoride, gallium arsenide, and cadmium fluoride has been measured in the infrared over the wavelength range 3.5 to 11 micrometers. A large dispersion was found in the coefficients of the fluorides; moreover, some of the coefficients were observed to reverse sign. The data for GaAs showed a small yet significant dispersion. The data for the alkaline-earth fluorides were fitted to a three parameter strain-dependent oscillator representation of the infrared-active transverse-optic (TO) phonon; the predominant contribution to the dispersion comes from the strain-induced TO phonon splitting; estimates were made to the strain-induced oscillator strength anisotropy. The GaAs data were fitted to the same model but with only two free parameters; here the predominant contribution to the dispersion came from the estimated strain-induced oscillator strength anisotropy of the TO phonon; the experimental data agree fairly well with the theory of Humphreys and Maradudin. The absolute piezo-optic constants have also been obtained at discrete laser wavelengths for the fluorides.
Author (GRA)

N82-33222# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. Dept. of Electrical Engineering.
ENHANCED TRACKING OF AIRBORNE TARGETS USING FORWARD LOOKING INFRARED MEASUREMENTS M.S. Thesis
Steven Keith Rogers Dec. 1981 358 p refs
(AD-A115581; AFIT/GEO/EE/81D-5) Avail: NTIS HC A16/MF A01 CSCL 12/1

Considerable work has been accomplished at AFIT (Armed Forces Institute of Technology) in the last three years to improve the tracking capability of the high energy laser weapon. The improvements were achieved via use of an adaptive extended Kalman filter algorithm. In this research, work is initiated on a tracker able to handle 'multiple hot spot' targets, in which digital signal processing is employed on the FLIR data to identify the underlying target shape. This identified shape is then used in the measurement model portion of the filter as it estimates target offset from the center of the field-of-view. Two tracking algorithms are developed. The first algorithm uses an extended Kalman filter to process the intensity measurements form a FLIR to produce target position estimates. The second algorithm uses a linear Kalman filter to process the position estimates of an improved correlation algorithm. This algorithm is improved over standard correlators by using thresholding to eliminate poor correlation information, dynamic information from the Kalman filter and it also uses the on-line derived target shape. Author (GRA)

N82-33223# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
SCENE ANALYSIS: APPLICATION OF TWO-DIMENSIONAL NONLINEAR FILTERING FOR TARGET ENHANCEMENT AND RECOGNITION M.S. Thesis
Darryl R. Stroup and Thomas D. Dorsey Dec. 1981 96 p refs (AD-A115563; AFIT/GE/GEO/EE/81D-57) Avail: NTIS HC A05/MF A01 CSCL 20/6

A nonlinear scene analysis algorithm is studied for complex scenes containing realistic targets and background clutter. Infrared and visible spectrum light images are processed. The algorithm combines the Fourier transform phase array of a scene with the Fourier transform magnitude of a template to create a new image. Clutter reduction ability and target recognition capability are examined in detail. GRA

N82-33224# Battelle Columbus Labs., Ohio.
STUDY OF THE EFFECTS OF SURFACE ROUGHNESS AND Ti DIFFUSION ON IN-PLANE SCATTERING IN Ti-LiNbO SUB 3 WAVEGUIDES Final Report, 20 Sep. 1980 - 19 Nov. 1981
David W. Vahey and James R. Busch 31 Mar. 1982 102 p refs (Contract N00173-80-C-0420)
(AD-A115713) Avail: NTIS HC A06/MF A01 CSCL 09/1

The primary objective of this program has been to understand and subsequently reduce the sources of scattering in planar Ti-diffused LiNbO3 waveguides. On the basis of previous work these were perceived to be surface roughness and surface index inhomogeneities associated with Li-/ti-O compound formation during diffusion. A secondary objective has been to characterize state-of-the-art waveguides to determine their potential for use in an integrated optical spectrum analyzer providing at least 40 dB dynamic range at the fourth off-axis pixel. A key ingredient to meeting these objectives was found to be the accurate determination of waveguide scattering parameters from in-plane scattering measurements. These were frustrated by superimposed background scattering associated with input and output coupling. Both prism and end-fire techniques were used. A statistical analysis employed to effectively subtract the background contribution provided this best estimate: Existing waveguides provide the 40 dB dynamic range at the fourth pixel that is marginally acceptable for the spectrum analyzer application; however, a + or = 5 dB uncertainty in dynamic range is within one standard deviation of our average value. In the case of 35 dB dynamic range at the fourth pixel, consistent with this uncertainty, an analysis of dynamic range versus pixel number is used to show that 40 dB dynamic range is still achieved at the tenth off-axis pixel. GRA

N82-33225# Catholic Univ. of America, Washington, D.C. Vitreous State Lab.
RADIATION HARDENING OF STRENGTHENED OPTICAL FIBERS AND DEVELOPMENT OF NEW FLUORIDE GLASSES Final Technical Report, 1 Feb. 1979 - 30 Sep. 1980
R. K. Mohr, J. H. Simmons, C. T. Moynihan, A. Barkatt, H. Hojaji, C. Williams, M. S. Boulos, E. O. Gbogi, and K. H. Chung Griffiss AFB, N.Y. RADC Apr. 1982 71 p refs
(Contract F19628-79-C-0061; AF Proj. 4600)
(AD-A115910; RADC-TR-82-86) Avail: NTIS HC A04/MF A01 CSCL 20/6

Two independent studies were conducted under this contract: (1) Radiation hardening of compressively strengthened optical fibers; (2) Development of new fluoride glasses. In the first study two preform fabrication processes based on phase separable, leachable alkali borosilicate glasses were evaluated for producing radiation hardened fibers. The first process, known as partial leaching, was found to yield low numerical aperture fibers with moderately high attenuation. Ultra-clean glass melting facilities and extensive composition studies would be required to correct these faults. This was beyond the resources of the contract. The second process, known as molecular stuffing, was used to produce alkali-modified high silica glasses doped with cerium oxide as a radiation hardening agent. Radiation damage kinetic tests were run on these glasses by irradiating the samples with 4-40 ns pulses of 15 MeV electrons and observing the absorption spectra for the time range 0.0000001 sec to 0.1 sec following the electron pulses. The results of these tests show that cerium is not effective, within the time range studies, in suppressing the radiation induced absorption for the high silica glasses tested. In the second study, under this contract, glasses in the HfF4-BaF2-LaF3 family were studied. The effects on glass forming of additions including PbF2, CsF, GdF3 and AlF3 glass was studied. GRA

N82-33226# Electronics Engineering Group (1842nd), Scott AFB, Ill. TRACALS and Electronic Systems Branch.
PROTOTYPE FIBER OPTIC SYSTEM TO REMOTE TRACALS RADARS
Jacob A. Radcliff and Kenneth E. Becker 15 Jun. 1982 48 p (AD-A116815; Rept-1842-EEG/EEIT-TR-82-09-EZ) Avail: NTIS HC A03/MF A01 CSCL 20/6

The transmission mediums currently used to remote Traffic Control and Landing Systems (TRACALS) radars are coaxial cables (coax) or a microwave link. Problems and limitations are encountered in using either medium. Coax is susceptible to electromagnetic interference, moisture, ground loops, lightning and electromagnetic pulse (EMP). Microwave links are susceptible to electromagnetic interference, propagation anomaly, electronic warfare and EMP. The coax remoting system used on the Precision Approach Radar (PAR) is highly susceptible to interference from power lines for runway lights and has a maximum remoting distance of 12,000 ft. Remoting TRACALS radars via a fiber optic system appeared to be a complete solution to the problems listed above. The 1842 EEG conducted a feasiblity study of the use of a FO system to remote a PAR (AFCC Technical Report, 1842 EEG/EEIT-TR-80-9). The AN/FPN-62 radar was used in conducting the study. The study demonstrated that an analog FO system can handle the combined analog/digital, time and frequency multiplexed signals which are passed over the AN/FPN-62 remoting system. A FO system appeared to be a desirable alternative and warranted a full investigation. GRA

N82-33227# Hughes Research Labs., Malibu, Calif.
A COHERENT FIBER FOR AN AIRBORNE HETERODYNE SENSOR Semiannual Report, Aug. 1981 - Feb. 1982
James A. Harrington Apr. 1982 50 p refs
(Contract DAAK80-81-C-0155)
(AD-A116989; DAVAA-TR-81-0155-01) Avail: NTIS HC A03/MF A01 CSCL 20/6

Three approaches have been chosen for the fabrication of a 10.6 micrometers coherent fiber. The first approach involves cladding our thallium halide fibers either during extrusion or in a separate post-extrusion process. The second approach relies on the successful development of a new 10.6 micrometer transparent glass, ZnCl2. The most speculative approach, derived from planar technology, requires that a cladding stripe be deposited on a ribbon of KRS-5 or other thallium halide. During the first six months of the program we worked on the first two approaches. We attempted to coextrude single-mode fiber from a composite clad-core billet. Unfortunately, the clad-core interface of the extruded fiber was very irregular after every coextrusion attempted. We thus are abandoning this approach. The ZnCl2 glass remains unstable (devitrifies) on exposure to atmospheric moisture. We are continuing our studies to stabilize the glass by adding various dopants.
Author (GRA)

N82-33228# California Univ., Livermore. Lawrence Livermore Lab.
RESULTS OF STUDIES OF FIBER-OPTIC LINKS FOR MFTF
Norman H. C. Lau 6 Oct. 1981 4 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26-29 Oct. 1981
(Contract W-7405-eng-48)
(DE81-023654; UCRL-86065; CONF-811040-6) Avail: NTIS HC A02/MF A01

The test approach, the evaluations, and the results of the studies of fiber optic links for the mirror fusion test facility (MFTF) are reviewed. The test results and evaluation give considerable confidence for the use of fiber optic links in the MFTF control and diagnostics systems. The performance, cost effectiveness,

and integration capability of the selected fiber optical elements are impressive. DOE

N82-33229# California Univ., Livermore. Lawrence Livermore Lab.
IMPACT OF MICROFABRICATION TECHNOLOGY ON X-RAY OPTICS
N.M. Ceglio Aug. 1981 54 p refs Presented at the Top. Conf. on Low Energy X-ray Diagnostics, Monterey, Calif., 8-10 Jun. 1981
(Contract W-7405-eng-48)
(DE82-000847; UCRL-86134; CONF-810651-10) Avail: NTIS HC A04/MF A01

Advances in, as well as future prospects for, X-ray microscopy, coded imaging, and space time resolved spectroscopy, resulting from improved microstructure fabrication capabilities are reviewed. Author

N82-33230# Ruhr Univ., Bochum (West Germany). Bereich Extraterrestriche Physik.
LASER SCATTERING EXPERIMENTS WITH SINGLE PARTICLES FOR INTERPRETATION OF THE OPTICAL PROPERTIES OF INTERPLANETARY DUST LABORATORY EXPERIMENT FOR DATA INTERPRETATION OF HELIOS EXPERIMENT 10 Z Final Report, May 1981
Karin Weiss Bonn Bundesministerium fuer Forschung und Techonologie Dec. 1981 99 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-81-047; ISSN-0170-1339) Avail: NTIS HC A05/MF A01, Fachinformationszentrum, Karlsruhe, West Germany DM 21

Interplanetary dust particles between 20 and 200 micrometers in size which contribute to the zodiacal light were simulated. A laser scattering apparatus was built in order to investigate the scattering properties of single particles in this size range. For these measurements, the particles were suspended electrostatically. The four elements of the scattering matrix which are relevant to the intensity and polarization of zodiacal light were measured. The particles consisted of terrestrial as well as of meteoritic material. A mixture of samples was used to simulate the size distribution and mineralogical composition of interplanetary dust. Analysis of these laboratory results with the empirical scattering function of interplanetary dust correctly defines a mixture of irregularly shaped translucent and opaque particles. Author (ESA)

N82-33231# Technische Hochschule, Karlsruhe (West Germany). Inst. fuer Stroemungslehre und Stroemungsmaschinen.
OPTICAL MEASURING TECHNIQUES AND APPLICATIONS IN THE SPACE OPTICAL LABORATORY Final Report, Feb. 1981
Herbert Oertel and Walter Jaeger Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 61 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-81-050; ISSN-0170-1339) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13

The setup and execution of various optical measuring techniques, such as are used in the laboratory model of the space optical laboratory, are described. Experiments in the field of interfacial and transport phenomena, suitable for use in a spacelab, are treated. These experiments show the universal applicability of these measuring instruments and give indications for the construction of a process chamber. Author (ESA)

N82-33232# National Bureau of Standards, Washington, D.C.
BACKSCATTER SIGNATURE SIMULATIONS Final Report, 1 Oct. 1980 - 1 Oct. 1981
B. L. Danielson Dec. 1981 102 p refs Sponsored in part by Army Communications Research and Development Command
(PB82-174186; NBS-TN-1050) Avail: NTIS HC A06/MF A01 CSCL 20F

A collection of computer generated backscatter signatures which represent realistic replicas of signals that can be encountered in optical time domain reflectometer (OTDR) systems are presented. Emphasis is placed on illustrating the appearance of backscatter signatures originating from localized and distributed imperfications which are superimposed on an otherwise uniform optical fiber. The details of these signatures are shown to be a function of the particular type of fiber perturbation, experimental parameters, and data reduction methods. This compilation of simulated responses is intended to facilitate the correct interpretation of OTDR signals as well as to point out sources of error which can arise in the characterization of optical fibers using backscatter techniques. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N82-33233*# RTS Labs., Inc., Gainesville, Fla.
GENERATION OF X-RAYS AND NEUTRONS WITH A rf-DISCHARGE Final Report
Richard T. Schneider Washington NASA Jun. 1982 145 p refs
(Contract NAS1-15812)
(NASA-CR-3570; NAS 1.26:3570; RTS-2/82) Avail: NTIS HC A07/MF A01 CSCL 20I

An experimental study concerning disk shaped plasma structures was performed. Such disk-shaped structures can be obtained using an RF discharge in hydrogen. The applied frequency was 1-2 Mhz. In case of operation in deuterium it was found that the discharge emits neutrons and X-rays, although the applied voltage is only 2 kV. This phenomenon was explained by assuming formation of plasma cavitons which are surrounded by high electric fields. The condition for formation of these cavitons is that the applied RF frequency is equal to the plasma frequency. The ions trapped in these resonance structures acquire sufficient energy that they can undergo fusion reactions with the ions in the surrounding gas. Author

N82-33234# California Univ., Berkeley. Electronics Research Lab.
PLASMA THEORY AND SIMULATION Final Progress Report, 1 Jan. 31 - Mar. 1981
C. K. Birdsall 31 Mar. 1981 22 p refs
(Contracts N00014-77-C-0578; DE-AT03-76ET-53064; DE-AM03-76SF-00034)
(AD-A115741; FPR-1) Avail: NTIS HC A02/MF A01 CSCL 20/9

Contents: Lower Hybrid Drift Instability; 2d Simulations and Nonlocal Theory; Velocity Space Aliasing, Hybrid Simulations of Theta Pinch Rotational Instabilities (Abstract); Implicit Particle Simulation Using Moments with Orbit Averaging; Plasma Sheath Simulation in 1d; ICFT; Lower Hybrid Drift Instability; Theory and 2d Simulations (Abstract); Rotational Instabilities in Field-Reversed Configurations; Results of Two-Dimensional Hybrid Simulations (Abstract); Orbit-Averaged and Implicit Particle Codes (Abstract). GRA

N82-33235# California Univ., Livermore. Lawrence Livermore Lab.
MEASURED AND PROJECTED PERFORMANCE OF PLASMA DIRECT CONVERTERS
William L. Barr and Ralph W. Moir 22 Oct. 1981 7 p refs Presented at the 9th Symp. of Eng. Probl. of Fusion Res., Chicago, 26-29 Oct. 1981; sponsored by IEEE Submitted for publication
(Contract W-7405-eng-48)
(DE82-002576; UCRL-86026; CONF-811040-61) Avail: NTIS HC A02/MF A01

Test results from two plasma direct converters and their predicted cost and performance on tandem mirror fusion reactors

are presented. The tests were done at high power density (approximately 70 W/sq cm) in steady state to simulate the predicted conditions in a reactor. A single stage unit and a two stage unit of the Venetian blind type were tested at up to 100 kv and 6 kW for a total time of about 80 hours. Measured efficiencies, when projected to a reactor, are typically about 50% for a single stage unit and 60 to 70% for a two-stage unit, depending on the energy distribution of the ions, the degree of subdivision of the collectors, and on the gas pressure. The high ambipolar potential in tandem mirror devices makes this good efficiency possible. When radiatively cooled grids are used, the incident power density is limited to about 100 W/sq cm by the thermionic emission of electrons. DOE

N82-33236# California Univ., Livermore. Lawrence Livermore Lab.

MACHINE AND PLASMA DIAGNOSTIC INSTRUMENTATION SYSTEM FOR THE TANDEM MIRROR EXPERIMENT UPGRADE

G. W. Coutts, F. E. Coffield, D. D. Lang, and R. S. Hornady 2 Oct. 1981 5 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26-29 Oct. 1981 Submitted for publication
(Contract W-7405-eng-48)
(DE82-001791; UCRL-85952; CONF-811040-16) Avail: NTIS HC A02/MF A01

To evaluate performance of a second generation tandem mirror machine (TMX), an extensive instrumentation system being designed and installed as part of the major device fabrication is described. The systems are expected to be operational during the start up phase of the TMX upgrade machine and provide bench marks for future performance data. In addition to plasma diagnostic instrumentation, machine parameter monitoring systems to be installed prior to machine operation are described. Simultaneous recording of machine parameters to permit evaluation of plasma parameters sensitive to machine conditions is planned. DOE

N82-33237# Oak Ridge National Lab., Tenn. Fusion Engineering Design Center.

DESIGN REVIEW OF THE INTOR MECHANICAL CONFIGURATION

T. G. Brown 1981 4 p Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26 Oct. 1981
(Contract W-7405-eng-26)
(DE82-002803; CONF-811040-71) Avail: NTIS HC A02/MF A01

The INTOR conceptual design has been carried out by design teams working in the home countries with periodic workshop sessions in Vienna to review the ongoing work and to make decisions on the evolving design. The decisions taken at each workshop session were then incorporated into each national design activity, so that the four national design contributions would progressively converge toward a single design with increasingly greater detail. This paper defines the final INTOR configuration that has evolved during the conceptual design phase, defining the major system design alternatives that were considered and the rationale for selecting the final system configuration. DOE

N82-33238# Association Euratom-CEA, Grenoble (France). Dept. de Recherches sur la Fusion Controlee.

TECHNICAL ASPECTS OF A GRILL COUPLING SYSTEM FOR LOWER HYDRID HEATING IN THE WEGA TOKAMAK

M. Lipa, R. Magne, T. K. Nguyen, and G. Tonon Sep. 1980 12 p refs Presented at the 11th Symp. on Fusion Technol., Oxford, 15-19 Sep. 1980
(CEA-CONF-5598; CONF-800950-21) Avail: NTIS (US Sales Only) HC A01; DOE Depository Libraries

Deuterium plasmas of a peak density corresponding to a frequency of 800 MHz were heated at powers largely exceeding the ohmic heating power. The grill and emitter are therefore designed to couple 800 KW for 40 ms. In order to optimize the power spectrum transferred to the ions, a waveguide grill, each 35 mm wide, was chosen. A modular stainless steel chamber and a special racetrack coil which increases the magnetic field ripple to 9% at the limiter radius were constructed. The entire grill is movable to permit adjustment of the plasma parameters at the grill mouth. Using the calculated field reflection coefficient 0.5 for this condition, the electric field in this section is 3.5-KV/cm. To avoid breakdown, the grill must be pumped down from the filling pressure in the 50 ms preceding application of the HF. A system of double windows and differential pumping was chosen. The line is of modular stainless steel construction and includes a wave transformer to go from the reduced to standard dimensions. The generator consists of four high powr klystron amplidiers with individual floating deck modulation. Regulation of the beam current using this system should permit regulation of the output power to about 5%. The generator is powered by a 60 KV, 60 A, 10 s power supply. DOE

N82-33239# Oak Ridge National Lab., Tenn.

PLASMA DIAGNOSTICS FOR FED

W. D. Nelson 1981 9 p refs Presented at the 9th Symp. on Engr. Probl. of Fusion Res., Chicago, 26 Oct. 1981
(Contract W-7405-eng-26)
(DE82-002888; CONF-811040-82) Avail: NTIS HC A02/MF A01

The plasma diagnostic instruments recommended for the fusion engineering device (FED) are described. The role and need for plasma diagnostics is discussed. Particles and radiation eminating from the plasma are identified. Design considerations are presented for the overall set of diagnostic instruments. Instruments used for control and for plasma performance measurements are included. DOE

N82-33240# Los Alamos Scientific Lab., N. Mex.

MULTIPLE-POINT THOMSON SCATTERING MEASUREMENT FOR THE ZT-40 REVERSED-FIELD PINCH

K. B. Freese, R. S. Massey, Rita Gribble, and J. D. Smith 1981 9 p refs Presented at the Conf. on Optics, Sante Fe, N. Mex., 6 Apr. 1981
(Contract W-7405-eng-36)
(DE82-002396; LA-UR-81-2793; CONF-810429-40) Avail: NTIS HC A02/MF A01

A multiple-point Thomson scattering device, capable of giving radial electron temperature profiles, was developed for the ZT-40 reversed field pinch experiment. The measurement is accomplished by observing the Thomson scattered spectrum from along an entire chord of focused ruby-laser light traversing the minor diameter of the plasma. A specially built, nearly diffraction limited laser is focused through the plasma using a long focal length lens. The detector uses specially designed collection optics to focus the entire scattering volume into an image dissecting array of fiber optics, which serves as the entrance slit to an anastigmatic spectrograph. The dispersed spectra from all the spatial locations are detected with a gated microchannel plate image intensifier, and recorded on an optical multichannel analyzer using a SIT tube detector. A computer interface is used for data transmission for analysis. DOE

N82-33241# Los Alamos Scientific Lab., N. Mex. Theoretical Div.

TURBULENCE AND SELF-CONSISTENT FIELDS IN PLASMAS

D. Pesme (Ecole Polytechnique, Palaiseau) and D. DuBois 1981 39 p refs Presented at the Conf. on Non-linear Probl.: Present and Future, Los Alamos, N. Mex., 2-6 Mar. 1981
(Contract W-7405-eng-36)
(DE82-000760; LA-UR-81-2834; CONF-810385-3) Avail: NTIS HC A03/MF A01

The role of self-consistency of the electric field in 1-D plasma turbulence is discussed. It is shown that in the non-self consistent electric field problem excellent agreement is found between numerical experiments and quasilinear theory whenever the imposed electric field Fourier components have random phase. A discrepancy is exhibited between quasilinear prediction and numerical simulations in the self-consistent electric field case. This discrepancy is explained by the creation of a long correlation time of the electric field resulting from a strong wave-particle interaction. A comparison is made between quasilinear and renormalized propagator theories, and the Dupree Clump theory. These three

theories are found to be self-contradictory in the regime of strong wave-particle interaction because they make an a priori quasigaussian assumption for the electric field. DOE

N82-33242# Los Alamos Scientific Lab., N. Mex.
EQUILIBRIUM AND POWER BALANCE CONSTRAINTS ON A QUASI-STATIC, OHMICALLY-HEATED FRC
K. F. McKenna, D. J. Rej, and M. Tuszewski 1981 5 p refs Presented at the 4th Ann. Compact Toroids Symp., Livermore, Calif., 27 Oct. 1981
(Contract W-7405-eng-36)
(DE82-002323; LA-UR-81-3152; CONF-811087-11) Avail: NTIS HC A02/MF A01

Field reversed configurations are generated on dynamic time scales using pulsed high power theta pinch technology, which does not easily extrapolate to reactor size devices. The attractiveness of FRC reactor scenarios is enhanced by the development of quasi-static formation techniques requiring moderate power levels. The quasi-static formation of FRC plasmas is analytically investigated. The set of equations which yield the time evolution of the ohmically heated plasa parameters, under the constraints of radial equilibrium and plasma energy losses, are presented. Subject to the simplifying assumptions used in the model, this equation set is completely general and would apply to any ohmically heated FRC. A sample calculation is presented in which the FRC azimuthal current, I sub theta, is generated by the rotating-magnetic field (RMF) technique. DOE

N82-33243# Princeton Univ., N. J. Plasma Physics Lab.
PRESSURE MEASUREMENTS IN MAGNETIC-FUSION DEVICES
H. F. Dylla Nov. 1981 36 p refs Presented at the Am. Vacuum Soc. Natl. Symp., Anaheim, Calif., 2-6 Nov. 1981
(Contract DE-AC02-76CH-03073)
(DE-82002833; PPPL-1852; CONF-811113-30) Avail: NTIS HC A03/MF A01

Accurate pressure measurements are important in magnetic fusion devices for: (1) plasma diagnostic measurements of particle balance and ion temperature; (2) discharge cleaning optimization; (3) vacuum system performance; and (4) tritium accountability. The application, required accuracy, and suitable instrumentation for these measurements are reviewed. Demonstrated uses of ionization-type and capacitance-diaphragm gauges for various pressure and gas-flow measurements in Tokamaks are presented, with specific reference to the effects of magnetic fields on gauge performance and the problems associated with gauge calibration. DOE

N82-33244# Oak Ridge National Lab., Tenn. Fusion Energy Design Center.
FUSION ENGINEERING DEVICE MAGNETIC SYSTEMS DESIGN
R. W. Derby (MIT), R. J. Hooper (GE), B. L. Hunter (GE), S. S. Kalsi (GE), V. C. Srivastava (GE), S. Kim (ANL), J. Schultz (MIT), and L. Turner (ANL) 1981 4 p refs Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26 Oct. 1981
(Contract W-7405-eng-26)
(DE82-002783; CONF-811040-72) Avail: NTIS HC A02/MF A01

The fusion engineering device (FED) magnetic system provides the basic mechanism for both plasma confinement and control. The magnetic system must meet high standards of reliability. It is assumed in the FED design that all superconducting magnets are designed for the lifetime of the device. Design conepts for toroidal field and poloidal field magnet systems are described. DOE

N82-33245# Oak Ridge National Lab., Tenn.
DESIGN AND ANALYSIS OF THE INTOR TOROIDAL FIELD-COIL STRUCTURAL SYSTEM
J. A. OToole, T. G. Brown, and T. E. Shannon 1981 4 p Presented at the 9th Symp. on Eng. Probl. of Fusion Res., Chicago, 26 Oct. 1981 Prepared in cooperation with Gruman Aerospace, Bethpage, N.Y.
(Contract W-7405-eng-26)
(DE82-002887; CONF-811040-81-draft) Avail: NTIS HC 02/MF A01

A feasible toroidal field coil structural system design. The various design criteria and their effects on the design are discussed. The rationale supporting the allowable cyclic stress of 200 MPa (29 ksi) is discussed. DOE

N82-33246# Georgia Inst. of Tech., Atlanta. School of Nuclear Engineering.
MOMENT-EQUATION APPROACH TO IMPURITY TRANSPORT IN TOKAMAKS
R. B. Bennett Sep. 1981 22 p refs
(Contract DE-AS05-78ET-52025)
(DE82-011692; GTFR-29) Avail: NTIS HC A02/MF A01

Neoclassical impurity transport through a fluid theory description, and experiments is reviewed. Three theoretical forms for particle transport are discussed. The distinctions among these three are mainly historical, as all can be included within the same framework, although the reslting transport effects differ greatly. The three, in order of historical development are: classical, Pfirsch-Schlueter, which introduces geometric effects, and neoclassical, which includes long mean free path effects. DOE

N82-33247# California Univ., Livermore. Lawrence Livermore Lab.
ENGINEERING PROBLEMS OF TANDEM-MIRROR REACTORS
R. W. Moir, W. L. Barr, B. M. Boghosian, G. A. Carlson, R. S. Devoto, J. N. Doggett, G. W. Hamilton, B. M. Johnson, W. N. Kumai, J. D. Lee et al 22 Oct. 1981 6 p refs Presented at the IEEE Symp. on Nucl. Sci., San Francisco, 21 Oct. 1981
(Contract W-7405-eng-48)
(DE82-002581; UCRL-86810; CONF-811040-63) Avail: NTIS HC A02/MF A01

A comparative evaluation of several end plug configurations for tandem mirror fusion reactors with thermal barriers is presented. The axi-cell configuration was selected for further study and will be the basis for a detailed conceptual design study to be carried out over the next two years. The axi-cell end plug has a simple mirror cell produce by two circular coils followed by a transition coil and a yin-yang pair, which provides for MHD stability. Scientific and technological understanding and innovation are needed in the area of thermal barrier pumping - a process by which unwanted particles are removed (pumped) from certain regions of velocity and real space in the end plug. Removal of exhaust fuel ions, fusion ash and impurities by action of a halo plasma and plasma dump in the mirror end region is another challenging engineering problem discussed. DOE

N82-33248# Max-Planck-Institut fuer Plasmaphysik, Garching (West Germany).
EXTENDED STANDARD VECTOR ANALYSIS FOR PLASMA PHYSICS
H. K. Wimmel Feb. 1982 25 p refs Sponsored by Euratom
(IPP-6/210) Avail: NTIS HC A02/MF A01

Standard vector analysis in three dimensional space is extended by two vector identities that are important for plasma physics applications. A conventional list of vector analytical formulas is examined. Expressions for inverse Delta dot product (alpha a equivalent), inverse Delta x (alpha a equivalent), inverse Delta (alpha a equivalent), inverse Delta dot product (a equivalent x b equivalent), inverse Delta x (a equivalent x b equivalent), inverse Delta (a equivalent dot product b equivalent), and sometimes inverse Delta dot product (a equivalent b equivalent) are given. Cases of higher order differentiation, special coordinate systems, and integral theorems are mentioned. Results complete the list of formulas for two vector fields and one inverse Delta operator. Formulas which involve three vector fields and one inverse Delta operator are introduced. Examples in magnetohydrodynamics and from guiding center drift theories are discussed. Author (ESA)

N82-33249# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
[ACTIVITIES OF THE INSTITUTE FOR PLASMA RESEARCH]

Annual Report, 1981 [FORSCHUNGSBERICHT 1981]
1981 19 p refs In GERMAN
Avail: NTIS HC A02/MF A01

Plasma magnetic waves under high beta conditions, propagation of plasma magnetic waves in inhomogeneous plasmas, plasma simulation, plasma temperature, confinement behavior and magnetoacoustic wave heating were studied. Time resolved electron temperature and density measurement during Tokamak discharge by periodically pulsed Thomson scattering and measurement of thermal ion spectra and the influence of impurities on the scattered spectrum CO2 laser scattering with heterodyne receiver were investigated. A 500 kt plasma focus and an electron cyclotron resonance heating experiment are described. Author (ESA)

N82-33250# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
DEVELOPMENT OF HIGHLY TURBULENT PLASMA STATES BY THE INTERCHANGE INSTABILITIES OF TYPE M = 0 [ENTWICKLUNG HOCHTURBULENTER PLASMAZUSTAENDE DURCH AUSTAUSCHINSTABILITAETEN VOM M = 0 TYP]
A. Hayd (Maschinenfabrik Augsburg-Nuernberg, AG, Munich), H. J. Kaeppeler, and P. Meinke (Maschinenfabrik Augsbrug-Nuernberg, AG, Munich) Mar. 1982 33 p refs In GERMAN
(IPF-82-1; MAN-B-099-042-EDS-003) Avail: NTIS HC A03/MF A01

The development of an instability from the linear via the nonlinear to the turbulent state is described, starting from the basic equations of magnetoplasmadynamics and using the REDUCE calculation program. It is shown how, starting from an interchange instability of type m=0 a turbulent state develops with extremely high Reynolds number and in which high local fields and high densities occur. The theory was applied to the development of a late plasma focus turbulent phase, initiated by the m=0 instability. The theory provides a universal scaling constant for the plasma focus. Author (ESA)

N82-33251# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
NUMERICAL SIMULATION OF ECHO PHENOMENA IN PLASMAS
E. Schulze Apr. 1982 109 p refs In GERMAN; ENGLISH summary
(IPF-82-2) Avail: NTIS HC A06/MF A01

A numerical method which solves the Vlasov and Poisson equations in a selfconsistent manner was used for plasma simulation. Langmuir waves, the two-stream instability and the gentle-bump instability were treated. Simulation confirms the analytical perturbation calculation of second order for plasma waves of small amplitude. Plasma simulation of echoes for large amplitude plasma waves leads to echoes of higher order. Echoes of sixth and seventh order are shown and the dependence of the echo amplitude on the pulse amplitudes is given. The plasma simulation for unstable distributions shows the transition of the echo to instability. Author (ESA)

N82-33252# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
THEORY OF NEUTRON SPECTRA FROM d-d REACTIONS IN THE LINEAR z-PINCH AND THE PLASMA FOCUS
R. Deutsch and H. J. Kaeppeler May 1982 36 p refs
(IPF-82-5) Avail: NTIS HC A03/MF A01

The probability density function of the ions in the azimuthal magnetic field of a linear z-pinch was derived by solving the Vlasov equation used to determine the neutron spectra. Neutron spectra were calculated for two models, differing in the energy distribution of the fast ions. A background plasma with slow ions was also considered. The interactions of the fast ions with the slow ions and beam-beam interactions between fast ions were considered. Typical spectra for arbitrary directions to the cylindrical axis are given. Considering the influence of the azimuthal magnetic field on the equilibrium density functions of the deuterons, the particularities of the neutron spectra are obtained without any of the contradictions typical of traditional models. Author (ESA)

N82-33253# Stuttgart Univ. (West Germany). Inst. fuer Plasmaforschung.
CALCULATION OF TURBULENCE PHENOMENA IN PLASMA FOCUS DYNAMICS USING REDUCE
A. Hayd (Maschinenfabrik Augsburg-Nuernberg AG, Munich), H. J. Kaeppeler, M. Maurer (Maschinenfabrik Augsburg-Nuernberg AG, Munich), and P. Meinke (Maschinenfabrik Augsburg-Nuernberg AG, Munich) May 1982 42 p refs
(IPF-82-7; MAN-B-099-042-EDS-020) Avail: NTIS HC A03/MF A01

The treatment of plasma focus dynamics was extended to the compression stage and the stage intermediate between maximum density and m=0 (axisymmetric) instability onset using the computer program REDUCE. This treatment was based on calculations of the development of highly turbulent plasma states resulting from m=0 instabilities and the application to the turbulent development in the late stage of a plasma focus experiment. A two fluid model of the magnetohydrodynamic equations was employed. Th nonlinear development was treated in omega k space and transformed back into t,t space to obtain local dynamic variables as functions of time. It is shown that for relatively high pinch currents, neutron production also appears in the intermediate phase, the life time of which increases with increasing pinch current. Author (ESA)

N82-33254# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany).
RADIATION TRANSPORT IN A STRONGLY MAGNETIZED PLASMA Thesis - Tech. Univ., Munich [STRAHLUNGSTRANSPORT IN EINEM STARK MAGNETISIERTEN PLASMA]
Werner Nagel May 1982 147 p refs In GERMAN
(MPE-176; ISSN-0340-8922) Avail: NTIS HC A07/MF A01

Polarization angular distribution and spectrum of X-rays from very hot and strongly magnetized plasmas were theoretically investigated in order to model cosmic pulsating X-ray sources. Two polarization modes with very differing free wavelength greatly influence the radiated spectrum. The anisotropy due to the magnetic field was studied. Directional characteristics calculations show a strongly frequency dependent plasma radiation characteristic. Cyclotron emission lines occur for very low optical thickness and go over into absorption lines for greater optical thickness. The results were compared with observations on the Her X-1 X-ray source and a model was setup, showing that the observed spectrum structure is probably an absorption line. Author (ESA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N82-33255*# IBM Watson Research Center, Yorktown Heights, N.Y.
OPTIMIZATION OF SOLAR CELLS FOR AIR MASS ZERO OPERATION AND A STUDY OF SOLAR CELLS AT HIGH TEMPERATURES Final Report
Harold J. Hovel and Stanley M. Vernon Hampton, Va. NASA. Langley Research Center Feb. 1982 36 p refs
(Contract NAS1-12812)
(NASA-CR-165862; NAS 1.26:165862) Avail: NTIS HC A03/MF A01 CSCL 20L

The power to weight ratio of GaAs cells can be reduced by fabricating devices using thin GaAs films on low density substrate materials (silicon, glass, plastics). A graphoepitaxy technique was developed which uses fine geometric patterns in the substrate to affect growth. Initial substrates were processed by etching 25 microns deep grooves into < 100 > oriented wafers; fine-grained polycrystalline GaAs layers 25-50 microns thick were then deposited on these and recrystallization was performed, heating the substrates to above the GaAs melting point in ASH3 atmosphere, resulting in large grain regrowth oriented along the

groove dimensions. Experiments with smaller groove depths and spacings were initially encouraging; single large GaAs grains would totally cover one and often two groove fields of 14 groove each spanning several hundred microns. Dielectric coatings on the grooved substrates were also used to modify the growth.
Author

N82-33256# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ELECTRON AND IMPURITY CORRELATIONS INFLUENCE THE CONDUCTIVITY OF DOPED SEMICONDUCTORS
A Ferreira daSilva, M. Fabbri, and I. C. daCunha Lima May 1982 15 p refs Submitted for publication
(INPE-2422-PRE/129) Avail: NTIS HC A02/MF A01

The recent HL-MT scheme for electric conduction in doped semiconductors is investigated by including the effect of impurity correlation. The impurity resistivities of Si:P and CdS:In are calculated. It is found that the resistivity is enhanced by electron correlation and quenched by impurity correlation. S.L.

N82-33257# Washington Univ., Seattle. Dept. of Electrical Engineering.
CONTROL OF GaAs MICROWAVE SCHOTTKY DIODE ELECTRICAL CHARACTERISTICS BY CONTACT GEOMETRY: THE GAP DIODE
S. J. J. Teng, R. E. Goldwasser, and F. J. Rosenbaum May 1982 104 p refs
(Contract N00014-79-C-0840; RR0210203)
(AD-A116162; ONR-TR-82-1) Avail: NTIS HC A06/MF A01 CSCL 20/12

This report presents a new low turn-on Schottky diode, whose I-V characteristics can be controlled by an ohmic gap between Schottky-barrier regions. A survey of barrier-height control techniques and the physics of Schottky-barrier and ohmic contacts is presented. Simple design theories for two types of gap-controlled diodes are discussed. GaAs VPE growth and diode microfabrication procedures are described and results are evaluated. The I-V characteristics, temperature sensitivity, and mixer conversion loss of packaged diodes have been measured. The physical properties and evaluation results of the device are discussed. Author (GRA)

N82-33258# Pennsylvania Univ., Philadelphia. Dept. of Physics.
BONDING AND INTERACTION OF ATOMS AND MOLECULES ON SINGLE CRYSTAL SURFACES Final Report, 15 Mar. 1978 - 14 Sep. 1981
William R. Graham and M. E. Caspari Jul. 1982 21 p refs
(Contract DAAG29-78-C-0013)
(AD-A116544; ARO-14679.1-MS) Avail: NTIS HC A02/MF A01 CSCL 20/2

The study of atomic and molecular adsorption on well-defined metal surfaces is of crucial importance to the understanding of many technologically important processes such as thin film growth, catalysis, corrosion, and the rates of chemical reactions on surfaces. The experimental methods employed in this study include the field ion microscope (FIM) and hyperfine interaction techniques. The systems chosen for study included the adsorption of hafnium and cadmium atoms on single crystal surfaces of tungsten and nickel. The choice of experimental techniques and systems for this study was dictated by a desire to evaluate hyperfine interaction techniques for the study of surface adsorption, through comparison with the results obtained by the now well established FIM technique for the study of surface adsorption. Author (GRA)

N82-33259# Xerox Palo Alto Research Center, Calif.
ATOMIC ARRANGEMENTS AND ELECTRONIC PROPERTIES OF SEMICONDUCTOR SURFACES AND INTERFACES Final Report, 1 Nov. 1980 - 31 Oct. 1981
D. J. Chadi and Richard M. Martin 6 May 1982 9 p refs
(Contract N00014-79-C-0704)
(AD-A115683) Avail: NTIS HC A02/MF A01 CSCL 20/12

The areas of research during the past 12 months have included: step-formation energies and domain orientation at Si(111) surfaces; the electronic structure of the Al-GaAs(110) surface chemisorption system; density-functional calculations of bulk properties of GaAs and of (100)GaAs-Ge interfaces; demonstration of the importance of correlation effects on the atomic and electronic structure of Si(111) surfaces; and derivation of an exact scaling law for the resistance of a thin wire for the one dimensional Anderson model containing Loth diagonal and off-diagonal disorder. GRA

N82-33260# Army Electronics Research and Development Command, Fort Monmouth, N. J. Electronics Technology/Devices Lab.
NUCLEAR TRACER MEASUREMENTS OF LOW TEMPERATURE WATER DIFFUSION IN SILICON DIOXIDE (SiO2) THIN FILMS
Robert L. Pfeffer Jun. 1982 94 p refs
(DA Proj. 1L1-161102-AH-47)
(AD-A116028; DELET-TR-82-4) Avail: NTIS HC A05/MF A01 CSCL 20/12

As part of an investigation of the physical basis underlying aspects of MOS processing technology, we have studied the transport mechanism by which water diffuses through thin SiO2 films. This process is responsible for the formation of oxide layers on silicon wafers by means of thermal steam oxidation, which is frequently employed in the manufacture of integrated circuit devices. We have performed tracer diffusion measurements involving network 180, demonstrating the importance of oxygen exchange between the SiO2 network and molecularly dissolved water. We have found that in the presence of water, bound network oxygen diffuses through SiO2 as a constituent of molecularly dissolved water. Employing methods common to state-of-the-art semiconductor technology, the central region within a thermal oxide layer grown on silicon was enriched with immobile 180 by ion implantation. After heating in atmospheres with different water contents, the extent of 180 diffusion was determined by observing changes in the concentration profile (i.e., the chemical concentration as a function of depth) of implanted 180 by means of nuclear resonance profiling. GRA

N82-33261# Crystal Specialties, Inc., Monrovia, Calif.
HIGH-PRESSURE GRADIENT-FREEZE GROWTH OF SINGLE CRYSTALS OF INDIUM PHOSPHIDE Final Technical Report, 1 Jan. - 15 Aug. 1981
Worth P. Allred Griffiss AFB, N.Y. RADC Apr. 1982 12 p refs (Contract F19628-81-C-0038; AF Proj. 4600)
(AD-A115810; RADC-TR-82-64) Avail: NTIS HC A02/MF A01 CSCL 20/2

Large polycrystalline InP ingots weighing up to 2,000 gms have been compounded in a gradient-freeze internally pressure balanced growth system. Ingots grown in the system have an impurity level of about 2 x 10 to the 16th power atoms/cc. This system promises to be a method by which polycrystalline and possibly single crystals can be grown in a few hours and at a reasonable cost. GRA

N82-33262# Rockwell International Corp., Anaheim, Calif. Microelectronics Research and Development Center.
EPITAXIAL GARNETS AND HEXAGONAL FERRITES Final Technical Report, 1 Feb. 1980 - 31 Mar. 1982
H. L. Glass and L. R. Adkins 20 Apr. 1982 8 p refs
(Contract F49620-80-C-0045; AF Proj. 2306)
(AD-A115998; C82-272/501; AFOSR-82-0503TR) Avail: NTIS HC A02/MF A01 CSCL 08/7

Epitaxial ferrite materials were developed for use in microwave and millimeter wave signal processing devices. Multiple layer magnetic garnet structures for magnetostatic wave (MSW) delay lines were emphasized. Theoretical analysis and experiments were performed on propagation of magnetostatic surface waves (MSSW), magnetostatic forward volume waves (MSFVW) and magnetostatic backward volume waves in structures containing up to four layers. In the experiments, one layer was a standard stripline substrate, 10 mil thick alumina. The other layers were YIG (yttrium iron garnet) films grown by liquid phase epitaxy on gadolinium gallium garnet substrates. Magnetic properties of the YIG layers wee adjusted by modifying their chemical composition. Delay characteristics were

measured in detail at frequencies between 2 and 4 GHz. Using MSSW, a multilayer structure having a flatter nondispersive delay than conventional single layer devices was demonstrated. Linear dispersion similar to that of conventional single layer devices but easier to implement was demonstrated for MSFVW propagation in a structure containing three epitaxial layers. GRA

N82-33263# Hughes Research Labs., Malibu, Calif.
GaAs SURFACE PASSIVATION FOR DEVICE APPLICATIONS Final Report, 15 Jun. 1978 - 15 Jun. 1981
C. L. Anderson and M. D. Clark Wright-Patterson AFB, Ohio AFWAL Mar. 1982 76 p
(Contract F33615-78-C-1444; AF Proj. 2305)
(AD-A116843; AFWAL-TR-82-1020) Avail: NTIS HC A05/MF A01 CSCL 20/12

This report describes the progress achieved during a three-year program to develop deposited dielectrics for GaAs device applications. Three applications of dielectrics have been investigated within this program: (1) isolation of control electrodes, (2) passivation of the GaAs surface, and (3) encapsulation of completed circuits. Deposition techniques employed were plasma-enhanced deposition (PED), pyrolytic chemical vapor deposition (CVD), and photo-chemical deposition (PCD). Plasma-enhanced dielectrics suitable for applications (1) and (3) were developed under Hughes internal funding early in the course of the program. Accordingly, the program was streamlined to concentrate on application (2). GRA

N82-33264# California Inst. of Tech., Pasadena.
CRYSTAL GROWTH IN SUBSTRATE-CONFINED LIQUIDS
J. O. McCaldin 15 Jun. 1982 5 p
(Contract MDA903-81-C-0354; ARPA Order 4284)
(AD-A117010) Avail: NTIS HC A02/MF A01 CSCL 20/2

The task objective was to develop crystal growth techniques utilizing substrate-confined-liquids (S.C.L.). In particular, crystals were usually grown as arrays of single crystals and include semiconductors useful as detectors. The primary technical problem remaining at this time was to extend techniques for growing a single crystal at each location in the array to include semiconductors useful in photodetection. The basic approach was experimental, utilizing a laboratory already equipped for vacuum evaporation and C.V.D. with analysis largely by optical, X-ray, and SEM techniques. The main result obtained so far was that arrays of In single crystals can be grown with a common basal plane orientation: (101) parallel to substrate surface. These crystals exhibited facets on their upper surfaces closely parallel to the substrate surface. Also cleaning procedures were developed for the In, which should be useful for In compounds as well. The main importance of this result is the possibility of carrying it over to the useful detector materials, InSb and CdTe. Based on various earlier findings, there appears to be a fair probability that stoichiometric growth of such semiconductors should occur similarly to that of In noted above. GRA

N82-33265# Purdue Univ., Lafayette, Ind.
STUDY OF ELECTRONS PHOTOEMITTED FROM FIELD-EMISSION TIPS Progress Report, 1 Jul. - 21 Dec. 1981
R. Reifenberger Dec. 1981 29 p refs
(Contract DE-AS02-79ER-10464)
(DE82-010420; DOE/ER-10464/3) Avail: NTIS HC A03/MF A01

The Study of Electrons Photoemitted from Field Emission Tips was undertaken to investigate the physical consequences of illuminating field emission tips with intense laser radiation. Perhaps the most significant aspect of the past year's work is the increasing conviction that photo-induced field emission is capable of probing the time-dependent formation of the image charge potential. DOE

N82-33266# Centro Brasileiro de Pesquisas Fisicas, Rio de Janeiro.
CONJECTURE ON THE CRITICAL FRONTIER OF THE FULLY ANISOTROPIC HOMOGENEOUS QUENCHED BOND-MIXED POTTS FERROMAGNET IN SQUARE LATTICE
Constantino Tsallis [1980] 18 p refs
(DE82-700088; CBPF-NF-023/80) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

It is conjectured that a logarithmic provides a very accurate approximation of the yet unknown critical frontier of a fully anisotropic homogeneous quenched bond mixed q state Potts ferromagnet in square lattice, where the random coupling constant J is distributed according to the laws P(J) and P'(J) for 'horizontal' and 'vertical' bonds respectively. Such an equation contains as particular cases a great number of exact results as well as a few recent conjectures which are only approximate. DOE

N82-33267# Goka (Tsuyoshi) Avionics, Sunnyvale, Calif. Lehrstuhl fuer Angewandte Mechanik und Stroemungsphysik.
SEMICONDUCTOR PROPERTIES OF 3-5 COMPOUNDS IN SOLID AND LIQUID STATE AND COMPILATION OF THEIR FLUID MECHANIC PARAMETERS Final Report, Jan. 1981
Volker Strunck Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 76 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-81-048; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15,95

All parameters which are essential for crystal growth are reviewed. Fundamental numbers, such as Prandtl, Schmidt and Lewis numbers, which are important for convective phenomena are emphasized. It is shown that the Prandtl number for liquid semiconductors assumes double or triple the value with increasing concentration and diminishing temperature compared with the case of pure metals. The Schmidt number behaves likewise. The ratio of momentum loss thickness to diffusion boundary layer thickness amounts to 50. The Lewis number reaches lower values approaching stoichiometric composition which correspond to better heat transfer of the single components. Furthermore, the influence of the Soret effect is pointed out. Author (ESA)

N82-33268# Standard Elektrik Lorenz A.G., Stuttgart (West Germany). Fachbereich Werkstoff und Bauelemente.
ELECTROLUMINESCENT POWDER LAYERS AND SOLID STATE LIGHT VALVE MATRICES FOR FLAT DISPLAYS Final Report, Jun. 1980
Kurt Koger, Joachim Lauckner, Felix Lutz, Siegfried Mueller, Juergen Pottharst, Eberhard Sailer, and Gerhard Wessel Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 108 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-207; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22,70

Two techniques were evaluated for matrix controlled flat displays: (1) powder electroluminescence (EL) and (2) solid state light valve matrix (SSLVM) construction. Results show that the ac excited phosphors have a brightness sufficient for many applications. Powder EL is advantageous in terms of cell preparation. Picture elements can be fabricated by known film techniques. However, since achievable lifetimes are insufficient for most applications, an explanation of the degradation processes must still be sought. The SSLVM technique was developed on the basis of liquid crystal or electro-optically active ceramics. The matrix design can be kept relatively simple when using the scattering mode for contrast generation. High switching voltages and unsatisfactory contrast behavior make further material development necessary. Author (ESA)

N82-33269# Siemens A.G., Munich (West Germany). Unternehmensbereich Bauelemente.
NEW DEVICE TECHNOLOGY FOR STANDARDIZATION OF PROCESSING STEPS AND IMPROVEMENT OF EFFICIENCY OF LIGHT EMITTING DIODES Final Report, Jun. 1981
Wolf Jakowetz and Gerhard Packeiser Bonn Bundesministerium fuer Forschung und Technologie Apr. 1982 128 p refs In GERMAN; ENGLISH summary
(BMFT-FB-T-82-049; ISSN-0340-7608) Avail: NTIS

HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 27 process control (industry)

A method of liquid phase epitaxy for the fabrication of GaP-N diodes was developed where a thin melt is limited at the bottom and the top by a substrate (sandwich epitaxy). In regard to standardization of processing steps, the effect of cleaning procedures was investigated by Auger electron spectroscopy for different III-V compound wafers. The application of Al Zn as standard contact for p-type material was tested. Suitable reflecting metallization for the chip LED backside with transparent substrate is defined. Samples of GaAsP-N vapor phase epitaxial wafers were characterized. The origin of crystal defects and their influence on efficiency was investigated. Results demonstrate a testing method, suitable for process control, that measures all parameters which determine the efficiency of a LED. Author (ESA)

N82-33270# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
MEASUREMENT OF SURFACE PHONON DISPERSION RELATIONS FOR LIF, NaF, AND KCL THROUGH ENERGY-ANALYZED INELASTIC SCATTERING OF A HELIUM ATOMIC BEAM Ph.D. Thesis - MIT
Robert Bruce Doak Sep. 1981 542 p refs
(MPIS-14/1981; ISSN-0436-1199) Avail: NTIS HC A23/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 67,10

The scattering from a crystal surface of a high intensity low energy, high velocity resolution, narrow helium atomic beam was investigated. The scattered beam was velocity-analyzed using standard time of flight (TOF) techniques. The TOF spectra showed multiple sharp energy-shifted maxima corresponding to creation and annihilation of surface phonons directed both parallel and antiparallel to the incoming beam. From these TOF shifts and the known scattering angles, the surface phonon frequency and wavevector were calculated. Different points of the phonon dispersion curve were probed. Interaction is found to be primarily with Rayleigh surface modes although the presence of bulk-like modes at the surface is also observed. Selective adsorption plays an important role in inelastic scattering. The bound life times of the helium atoms are calculated to range from 6 to 60 psec for the lowest to the highest bound states on LiF, respectively. Author (ESA)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N82-33271# Massachusetts Inst. of Tech., Cambridge. Dept. of Electrical Engineering and Computer Science.
MAGNETIC FIELD SYNTHESIS FOR MICROWAVE MAGNETICS Final Technical Report, 1 Jan. 1979 - 30 Nov. 1980
Frederic R. Morgenthaler Griffiss AFB, N.Y. RADC Apr. 1982 175 p refs
(Contract F19628-79-C-0047)
(AD-A115889; RADC-TR-82-95) Avail: NTIS HC A08/MF A01 CSCL 20/10

The Microwave and Quantum Magnetics Group of the M.I.T. Department of Electrical Engineering and Computer Science undertook a two-year research program directed at developing synthesis procedures that allow magnetostatic and/or magneto-elastic modes to be specially tailored for microwave signal processing applications that include magnetically tunable filters and limiters as well as delay lines that are either linearly dispersive or nondispersive over prescribed bandwidths. Special emphasis was given to devices employing thin films of yttrium iron garnet (YIG) that are blessed with spatially nonuniform dc magnetic fields. Author (GRA)

N82-33272# Helsinki Univ. (Finland). Research Inst. for Theoretical Physics.
TEST OF EINSTEIN LOCALITY
Matts Roos Nov. 1980 12 p refs
(HU-TFT-80-5-Rev; ISBN-951-45-1931-0) Avail: NTIS HC A02/MF A01

Einstein locality imples that spacelike separated coherent quantum systems do not interfere, and that all interferences must propagate with at most the speed of light. It then follows that the reaction e+e- yields K to the zero power anti-K to the zero power must yield some Ksub(s)Ksuu(s) decays in apparent violation of P and C conservation. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N82-33273 Elliott-Automation Space and Advanced Military Systems Ltd., Frimley (England).
AIR COMMAND AND CONTROL
D. K. Hitchins 1981 19 p Presented at Marconi 81 Symp., 24 Jun. 1981
(Rept-97) Avail: NTIS HC A02

Factors which influence air command and control, e.g., the philosophy, balance, and structure of air power are discussed. Operational analysis, implementation of weapon systems, and human performance factors are considered. Command hierarchies, communications, and artificial intelligence are mentioned. The HITAS airborne automatic threat assessment system is introduced. Author (ESA)

N82-33274# Pearson and Associates, Springfield, Va.
LOS ALAMOS NATIONAL LABORATORY USER SATISFACTION MEASUREMENT STUDY
Sep. 1981 16 p refs
(Contract W-7405-eng-36)
(LA-9013-MS) Avail: NTIS HC A02/MF A01

A computer user satisfaction measurement study was conducted. Areas of greatest potential improvement in computing services were identified. A baseline of satisfaction with the computing services and the factors that are most important to the users were established. Data to aid in the establishment of service goals was provided. S.L.

N82-33275# Woodard-Clyde Consultants, San Francisco, Calif. Decision Analysis Group.
DECISION ANALYSIS: STATE OF THE FIELD
Ralph L. Keeney Mar. 1982 28 p refs
(Contract N00014-81-C-0536)
(AD-A115964; TR-82-2) Avail: NTIS HC A03/MF A01 CSCL 05/10

This article, written for the non-decision analyst, describes what decision analysis is, what it can and cannot do, why one should care to do this, and how one does it. In the process, we also hope to dispel some myths: decision analysis is a tool of operations research and management science; some analyses are objective and value-free; it would be desirable to have 'objective, value-free' analyses; decision analysis solves decision problems; some decision problems are too difficult for decision analysis; decision analysis and decision theory are the same thing. To accomplish these purposes, we set the stage by describing the

decision environment. Then the article presents an overview of decision analysis and provides additional sources for its foundations, procedures, history, and applications. GRA

N82-33276# Elliott-Automation Space and Advanced Military Systems Ltd., Frimley (England).
RELIABILITY, AVAILABILITY MAINTAINABILITY, PLANNING FOR PROJECT DEVELOPMENT
J. F. Lee 1981 12 p Presented at Marconi 81 Symp., 24 Jun. 1981
(Rept-92) Avail: NTIS HC A02/MF A01

A reliability and maintenance (RM) plan which can be adapted by customers and contractors to any project is presented. Individual/group responsabilities, procedures, and documentation are outlined. The plan includes independent maintenance support systems and operational systems. This approach allows the additional, RM requirements of the maintenance subsystem to be met, without confusing the operational system RM program. Author (ESA)

N82-33277# National Academy of Sciences - National Research Council, Washington, D. C. Committee on Computer-Aided Manufacturing.
INNOVATION AND TRANSFER OF US AIR FORCE MANUFACTURING TECHNOLOGY: THREE CASE STUDIES Final Report
Nov. 1981 52 p
(Contract F49620-78-C-0027)
(PB82-161779) Avail: NTIS HC A04/MF A01 CSCL 05A

Research on attemps to transfer three Air Force-sponsored innovations-projects on hot isostatic pressing, automatic assembly drilling, and composite tape-laying are described. The hot isostatic pressing project was successfully transferred, while attempts to transfer the other two were judged failures by the Air Force. It was found that concepts might transfer at times when particular embodiments (physical configurations) of a concept do not. To judge whether an attempted transfer of technology is successful, one should determine whether the concept or the embodiment is the more valuable part. GRA

N82-33278# Wisconsin Univ., Milwaukee.
TOWARD AN UNDERSTANDING OF INNOVATION ADOPTION: AN EMPIRICAL APPLICATION OF THE THEORETICAL CONTRIBUTIONS OF DOWNS AND MOHR Executive Summary
Richard D. Bingham, Patricia K. Freeman, and Claire L. Felbinger 1981 25 p refs
(Grant NSF PRA-79-20149)
(PB82-164773; NSF/ISI-81004) Avail: NTIS HC A02/MF A01 CSCL 05A

An innovation study addressing the instability of findings in innovative research with regard to complex organizations is investigated. Factors identified by Downs and Mohr as the possible causes of this instability and their methodologyical prescriptions toward the development of an integrative theory are examined. The factors are (1) variation among primary attributes, (2) interaction, (3) ecological inferences, and (4) varying operationalizations of innovation. GRA

N82-33279# National Bureau of Standards, Washington, D.C.
EXECUTIVE GUIDE TO ADP CONTINGENCY PLANNING
James K. Shaw and Stuart W. Katzke Jan. 1982 19 p refs
(PB82-165226; NBS-SP-500-85; LC-81-600182) Avail: NTIS HC A02/MF A01 CSCL 05A

This publication has been prepared for executives and managers who depend on ADP resources and services to accomplish the organizational objectives for which they are responsible. The goal is to help in understanding the need for Automatic Data Processing (ADP) contingency planning, to specify management's scope of involvement, to indicate in summary form the contents of ADP contingency plans and how one proceeds in developing such plans. Author

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N82-33280# Naval Training Analysis and Evaluation Group, Orlando, Fla. Training Analysis and Evaluation Group.
CHIEF OF NAVAL AIR TRAINING AUTOMATED MANAGEMENT INFORMATION SYSTEM (CAMIS) USERS GUIDE
Thomas O. Peeples and Gary W. Hodak Apr. 1982 56 p
(AD-A115852; TAEG-TR-121) Avail: NTIS HC A04/MF A01 CSCL 09/2

An automated method of reporting flight training and resource utilization information is provided. The CAMIS is comprised of 11 programs which (1) record squadron flight data, student performances, availability of assets, (2) maintain historical data, and (3) produce a variety of reports. This report documents and describes the CAMIS as developed to date and provides a guide to operation of the system. Author

N82-33281# Naval Ship Research and Development Center, Bethesda, Md. Computation, Mathematics and Logistics Dept.
INFORMATION SYSTEMS DESIGN METHODOLOGY: OVERVIEW Final Report, Jun. 1981 - May 1982
David K. Jefferson May 1982 65 p refs
(AD-A115902; DTNSRDC-82/043) Avail: NTIS HC A04/MF A01 CSCL 09/5

A six-phase methodology for designing an information system is described: formation of the system outline, analysis of requirements, design of the global logical data base, definition of data base processes, design of the physical data base, and simulation of data base operations. The methodology is based on the extensive use of computer-aided design tools, including the Problem Statement Language/Problem Statement Analyzer (PSL/PSA). The development and application of the methodology to a very large design effort are described; numerous actual problems are described to demonstrate the need for the methodology. Author

N82-33282# Mitre Corp., Bedford, Mass.
USER-SYSTEM INTERFACE DESIGN FOR COMPUTER-BASED INFORMATION SYSTEMS
Sidney L. Smith Hanscom AFB, Mass. ESD Apr. 1982 188 p refs
(Contract F19628-81-C-0001; AF Proj. 572C)
(AD-A115853; ESD-TR-82-132; MTR-8464) Avail: NTIS HC A09/MF A01 CSCL 09/2

A structured checklist of (USI) functional capabilities is proposed to aid in requirements definition. A compilation of 375 design guidelines is offered here for major USI functional areas of data entry, data display, and sequence control, revising and enlarging previously proposed guidelines. Potential computer aids are briefly described for generation of draft USI functional specifications, the earliest stage of design documentation. Author

N82-33283# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
QUERY PROCESSING IN DISTRIBUTED HETEROGENEOUS DATABASES
Kuan-Tsae Huang and Wilbur B. Davenport, Jr. Dec. 1981 18 p refs
(Contract N00014-77-C-0532)
(AD-A115981; LIDS-P-1212) Avail: NTIS HC A02/MF A01 CSCL 09/2

In order to bring distributed heterogeneous DBMSs which are implemented with relational, CODASYL or hierarchical models together to share the information resources and build new kinds of applications, a relational model is proposed as global conceptual model and ALPHA as global nonprocedual high level query language. The distributed query processing scheme in this

environment is described. A scheme translation and query translation for CODASYL system case are discussed. Relational and hierarchical systems can be treated similarly. Author

N82-33284# Systems and Applied Sciences Corp., Riverdale, Md.
STRATEGY PAPER ON EFFICIENT AND EFFECTIVE DISSEMINATION PLANS FOR THE INFORMATION DISSEMINATION SYSTEM OF THE DEPARTMENT OF ENERGY'S ECONOMIC REGULATORY ADMINISTRATION, OFFICE OF UTILITY SYSTEMS, DIVISION OF RATES AND ENERGY MANAGEMENT
[1982] 25 p
(Contract DE-AC01-80RG-10367)
(DE82-011042; DOE/RG-10367/T7) Avail: NTIS HC A02/MF A01

The purposes of the DOE/DREM bibliographic energy utility data base consisting of research and experimental studies are reviewed. Current distribution operations, such as, mass mailings, direct mailings, SASC/DREM publications, conferences/ workshops, and telephone communications are discussed. The objectives of these operations are presented. The four techniques selected and proposed to maintain and promote clearinghouse products and services are discussed: (1) direct mail advertising, (2) advertising through newsletters, (3) brochure and other related information clearinghouse utilization, and (4) conferences and/or workshops. DOE

N82-33285# Florida Univ., Gainesville. Database systems Research and Development Center.
A DMS COST/BENEFIT DECISION MODEL: MATHEMATICAL MODELS FOR DATA MANAGEMENT SYSTEM EVALUATION, COMPARISON AND SELECTION (PART 1) Interim Report
Jozo J. Dujmovic and Richard Elnicki Jul. 1981 168 p refs
(Contract NB-80-SBCA-0449)
(PB82-170150; NBS-GCR-82-374) Avail: NTIS HC A08/MF A01 CSCL 05A

A detailed description of the LSP method is presented. The main topics include: (1) development of system requirement tree; (2) detailed classification and description of elementary criteria; (3) logic aggregation of preference; (4) the analysis of elementary and compound preference aggregation functions; (5) cost analysis models for data management systems; and (6) a detailed presentation of the cost preference analysis for system comparison and selection. GRA

N82-32544*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A FEDERATED INFORMATION MANAGEMENT SYSTEM FOR THE DEEP SPACE NETWORK M.S. Thesis - Univ. of Southern California
E. Dobinson *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 144-152 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 05B

N82-32547*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN INTRODUCTION TO THE NEW PRODUCTIVITY INFORMATION MANAGEMENT SYSTEM (PIMS)
R. Hull *In its* The Telecommun. and Data Acquisition Report 15 Aug. 1982 p 173-189 refs (For primary document see N82-32529 23-31)
Avail: NTIS HC A10/MF A01 CSCL 05B

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N82-33286# European Space Agency, Paris (France).
SCENARIOS OF ECONOMIC DEVELOPMENT WITHIN THE EUROPEAN COMMUNITY UP TO THE YEAR 2000
Hermann Keimel and Alfons Schimtt Feb. 1982 177 p refs Transl. into ENGLISH of "Szenarien der wirtschaftlichen Entwicklung der EG bis zum Jahr 2000" rept. DFVLR-FB-81-08 DFVLR, Cologne, Feb. 1981 173 p
(ESA-TT-730; DFVLR-FB-81-08) Avail: NTIS HC A09/MF A01; original German version available from DFVLR, Cologne DM 28,70

A tendency scenario is projected in order to assess the influence of the European economy on the need for long-distance transportation, i.e., by air. The tendency scenario is supplemented with two additional scenarios which illustrate possible trends in the European Economic Community either towards a technology based economy or towards a service economy. In the technology scenario it is assumed that after a stagnative period of transition, economic growth impetus will result from technological innovations and world trade expansion. The service economy scenario describes a situation of low economic growth paralleled by strong expansion in the service sector. Based on the qualitative characteristics of the scenarios, quantitative forecasts are made on economic structure. Results are used to show the effect of transportation demand for the scenarios on aircraft development feasibility. Author (ESA)

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N82-33287# Committee on Appropriations (U. S. House).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT-INDEPENDENT AGENCIES APPROPRIATIONS FOR 1983. PART 5: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Washington GPO 1982 116 p Hearings before a subcomm. of the Comm. on Appropriations, 97th Congr., 2nd Sess., 27 Apr. 1982
(GPO-95-486) Avail: Committee on Appropriations

The federal budget appropriations to the National Aeronautics and Space Administration for fiscal year 1983 are explained with regard to current and projected cost data. A brief description of project activities is included. L.F.M.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N82-33288* National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
LOW-DRAG GROUND VEHICLE PARTICULARLY SUITED FOR USE IN SAFELY TRANSPORTING LIVESTOCK Patent
Edwin J. Saltzman, inventor (to NASA) Issued 10 Aug. 1982 7 p Filed 5 Aug. 1980 Supersedes N80-33312 (18 - 23, p 3220)
(NASA-Case-FRC-11058-1; US-Patent-4,343,506; US-Patent-Appl-SN-175453; US-Patent-Class-296-1S; US-Patent-Class-105-2R; US-Patent-Class-244-53B; US-Patent-Class-296-24C; US-Patent-Class-296-91) Avail: US Patent and Trademark Office CSCL 13F

A low-drag truck consisting of a tractor-trailer rig characterized by a rounded forebody and a protective fairing for the gap conventionally found to exist between the tractor and the trailer is described. The fairing particularly suited for establishing an attached flow of ambient air along its surfaces. The truck is also comprised of a forward facing, ram air inlet and duct and a plurality of

submerged inlets and outflow ports communicating with the trailer for continuously flushing heated gases from the trailer as the rig is propelled at highway speeds.
Official Gazette of the U.S. Patent and Trademark Office

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N82-33289*# Lowell Observatory, Flagstaff, Ariz. Planetary Research Center.
THE DIAMETER OF 88 THISBE FROM ITS OCCULTATION OF SAO 187124
R. L. Millis, L. H. Wasserman, O. G. Franz, N. M. White, E. Bowell, A. Klemola (Lick Observatory, Santa Cruz, Calif.), R. C. Elliott (Wisconsin, Univ., Eau Claire), W. G. Smethells (Wisconsin Univ., Eau Claire), P. M. Price (Wisconsin Univ., Eau Claire), and C. P. McKay (Colorado Univ., Boulder) [1982] 23 p refs Sponsored in part by Digital Equipment Corp., Mrs. R. L. Putnam, the Perkin Fund, and Navy
(Grants NsG-7603; NSF AST-79-09098)
(NASA-CR-169312; NAS 1.26:169312) Avail: NTIS HC A02/MF A01 CSCL 03A

The 7 October, 1981 occultation of SAO 187124 by 88 Thisbe was observed at twelve sites. The occultation observations, together with information about the asteroid's light curve, gives a mean diameter for Thisbe of 232 + or - 10 km. This value is 10 percent larger than the previously published radiometric diameter of Thisbe. Author

N82-33290*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INFRARED EMISSION LINES IN PLANETARY NEBULAE
Harriet L. Dinerstein (Texas Univ., Austin) Jul. 1982 13 p refs (NASA-TM-84279; A-9030; NAS 1.15:84279) Avail: NTIS HC A02/MF A01 CSCL 03A

Infrared spectroscopy was used to detect many forbidden fine structure emission lines in planetary nebulae. Measurements of these lines offer sensitive probes of the physical conditions and ionization structure, and lead to improved abundance determinations. S.L.

N82-33291# Committee on Science and Technology (U. S. House).
OVERSIGHT: SPACE TELESCOPE, 1982
Washington GPO 1982 209 p refs Hearing before the Subcomm. on Space Sci. and Appl. of the Comm. on Sci. and Technol., 97th Congr., 2nd Sess., No. 99, 24-25 May 1982
(GPO-96-006) Avail: Subcommittee on Space Science and Applications

The oversight hearing of the House subcommittee on Space Science and Applications concerning the development of the Space Telescope is presented. Plans for future utilization of the telescope are discussed. L.F.M.

N82-33292# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
TECHNICAL OBSERVATIONS ON LOW ENERGY GAMMA RAY ASTRONOMY [TECHNICAS OBSERVACIONAIS DA ASTRONOMIA DE RAIOS GAMA DE BAIXA ENERGIA]
Jose Marques daCosta Feb. 1982 114 p refs IN PORTUGUESE; ENGLISH summary Presented at the First School of Advanced Astrophys., Sao Paulo, Brazil, 12-13 Jun. 1981
(INPE-2333-MD/018) Avail: NTIS HC A06/MF A01

The detection of gamma rays of cosmic origin is very difficult. The principal problems involved are: (1) the weak intensities of the gamma ray fluxes, (2) the 'local' and instrumental photon backgrounds, and (3) the nonexistence of a telescope which can detect gamma rays directly - the detection methods always involve the interaction of gamma ray photons and secondary electrons with matter. The observational techniques used in gamma ray astronomy are dependent on the energy range of the gamma rays to be detected. The most common telescopes of low energy gamma ray astronomy (50 KeV - 20 MeV) use NaI(Tl) scintillators, or germanium diodes, as principal detectors, surrounded by an active shield (anticoincidence) of organic or inorganic scintillators. S.L.

N82-33293# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
IUE OBSERVATIONS OF HOT STARS
Peter S. Conti [1982] 17 p refs Sponsored by NSF
Avail: NTIS HC A02/MF A01

Stellar winds are found in hot and luminous stars of all types. We see evidence of these winds in P Cygni profiles of resonance lines in the UV spectral regions, and obtain density information from them, and from optical mission lines and from free-free radiation in the infrared and radio continual from the ionized plasma. Data recently acquired from the IUE satellite are now sufficient to enable us to outline the broad parameters of these winds. It is found that for the hottest stars, those of O-type, the mass loss rate M is proportional to L alpha. A proportionality between M and L is predicted by the theory of radiatively driven winds; the value for alpha is also anticipated by the details of the theory. The dispersion of individual stellar values may be due to observational uncertainty alone, but it may also suggest that other physical parameters affect the stellar winds. The kinetic energy input of the stellar winds to the interstellar medium is considerable and may, in aggregate, be of the same order as the contribution of supernovae. Author

N82-33294*# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
WOLF-RAYET PHENOMENA
P. S. Conti [1982] 34 p refs Sponsored by NASA and NSF Prepared in cooperation with NBS
(NASA-CR-169299; NAS 1.26:169299) Avail: NTIS HC A03/MF A01 CSCL 03A

The properties of stars showing Wolf-Rayet phenomena are outlined along with the direction of future work. Emphasis is placed on the characteristics of W-R spectra. Specifically the following topics are covered: the absolute visual magnitudes; the heterogeneity of WN spectra; the existence of transition type spectra and compositions the mass loss rates; and the existence of very luminous and possibly very massive W-R stars. Also, a brief overview of current understanding of the theoretical aspects of stellar evolution and stellar winds and the various scenarios that have been proposed to understand W-R spectra are included. J.M.S.

N82-33295*# Lockheed Missiles and Space Co., Palo Alto, Calif.
IUE STUDIES OF X-RAY K-M DWARFS Final Report
H. M Johnson 30 Jun. 1982 3 p
(Contract NAS5-22619)
(NASA-CR-170430; NAS 1.26:170430) Avail: NTIS HC A02/MF A01 CSCL 03A

X-ray and ultraviolet data are presented with various optical data. Certain flare star and BY Draconis type variable star data are included. The results are discussed in terms of parameters of interest such as rotation and binary incidence. Deviations from correlations of properties that are found in the literature are noted. The fairly sizable number of red dwarfs that were observed inhance the value of the set of data. The coronae and the chromospheres of transition regions of the nearby stars are also considered. S.L.

N82-33296*# Space Telescope Science Inst., Huntsville, Ala.
THE SPACE TELESCOPE OBSERVATORY. SPECIAL SESSION

OF COMMISSION 44, IAU 18TH GENERAL ASSEMBLY
Donald N. B. Hall, ed. 1982 138 p refs Conf. held in Patras, Greece, Aug. 1982; sponsored by NASA. Marshall Space Flight Center and ESA
(Contract NAS5-26555)
(NASA-CP-2244; NAS 1.55:2244) Avail: NTIS HC A07/MF A01 CSCL 03A

An overview of the scientific capabilities and potential of the Space Telescope is presented. For individual titles, see N82-33297 through N82-33306.

N82-33297*# Space Telescope Science Inst., Huntsville, Ala.
SCIENCE OPERATIONS WITH SPACE TELESCOPE
Riccardo Giacconi *In its* The Space Telescope Obs. 1982 p 1-15 refs (For primary document see N82-33296 23-89)
Avail: NTIS HC A07/MF A01 CSCL 03A

The operation, instrumentation, and expected contributions of the Space Telescope are discussed. Space Telescope capabilities are described. The organization and nature of the Space Telescope Science Institute are outlined, including the allocation of observing time and the data rights and data access policies of the institute. J.D.

N82-33298*# European Space Agency, Noordwikj (Netherlands). Astronomy Div.
EUROPEAN ASTRONOMY AND THE SPACE TELESCOPE: THE SPACE TELESCOPE EUROPEAN COORDINATING FACILITY
F. Macchetto *In* Space Telescope Science Inst. The Space Telescope Obs. 1982 p 16-19 (For primary document see N82-33296 23-89)
Avail: NTIS HC A07/MF A01 CSCL 03A

The role of the European Coordinating Facility is described. European participation in the Space Telescope Science Institute and the relation of Space Telescope to ground-based astronomy in Europe are discussed. J.D.

N82-33299*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE SPACE TELESCOPE OBSERVATORY
C. R. ODell *In* Space Telescope Science Inst. The Space Telescope Obs. 1982 p 20-27 refs (For primary document see N82-33296 23-89)
Avail: NTIS HC A07/MF A01 CSCL 03A

The history of the observatory is briefly described, as is the overall system design. The principal design features that are important to the scientific user are described. The present status of preparation for launch in the spring of 1985 is summarized. J.D.

N82-33300*# California Inst. of Tech., Pasadena.
THE WIDE FIELD/PLANETARY CAMERA
James A. Westphal, W. A. Baum, A. D. Code, D. G. Currie, G. E. Danielson, J. E. Gunn, T. F. Kelsall, J. A. Kristian, C. R. Lynds, P. K. Seidelmann et al *In* Space Telescope Science Inst. The Space Telescope Obs. 1982 p 28-39 (For primary document see N82-33296 23-89)
Avail: NTIS HC A07/MF A01 CSCL 03A

A wide site of potential astronomical and solar system scientific studies using the wide field planetary camera on space telescope are described. The expected performance of the camera as it approaches final assembly and testing is also detailed. Author

N82-33301*# European Space Agency, Noordwikj (Netherlands). Astronomy Dept.
THE FAINT OBJECT CAMERA
F. Macchetto *In* Space Telescope Science Inst. The Space Telescope Obs. 1982 p 40-54 (For primary document see N82-33296 23-89)
Avail: NTIS HC A07/MF A01 CSCL 03A

The Faint Object Camera fully exploits the spatial resolution capability of the Space Telescope on the very faintest detectable objects over a broad wavelength range. A full complement of filters, objective prisms and polarizers, a choice of coronographic masks, and a variety of scan formats extend the scientific versatility of the direct imaging mode. In addition, the Faint Object Camera provides the unique facility of long-slit spectroscopy to Space Telescope observers. Author

N82-33302*# California Univ., San Diego, La Jolla. Center for Astrophysics and Space Sciences.
ASTRONOMICAL CAPABILITIES OF THE FAINT OBJECT SPECTROGRAPH ON SPACE TELESCOPE
R. J. Harms *In* Space Telescope Science Inst. The Space Telescope Obs. 1982 p 55-75 refs (For primary document see N82-33296 23-89)
Avail: NTIS HC A07/MF A01 CSCL 03A

Examples of scientific observing programs planned with the Faint Object Spectrograph on Space Telescope are presented. An overview of the spectrograph design and operation is presented. The expected astronomical performance of the instrument is described in some detail. Author

N82-33303*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE HIGH RESOLUTION SPECTROGRAPH FOR THE SPACE TELESCOPE
John C. Brandt, A. Boggess, S. R. Heap, S. P. Maran, A. M. Smith, E. A. Beaver (California Univ., San Diego), J. B. Hutchings (Dominion Astrophysical Observatory), M. A. Jura (California Univ., Los Angeles), J. L. Linsky (Colorado Univ., Boulder), B. D. Savage (Wisconsin Univ.) et al *In* Space Telescope Science Inst. The Space Telescope Obs. 1982 p 76-105 refs (For primary document see N82-33296 23-89)
Avail: NTIS HC A07/MF A01 CSCL 03A

The High Resoltuion Spectrograph (HRS) in conjunction with the Space Telescope (ST), extends ultraviolet astronomical spectroscopy to higher spectra, spatial, and time resolutions than previously achieved, as well as to fainter and more distant celestial objects. Other significant advances inherent in the instrument are high photometric accuracy and efficient operation via exposure meter control and real time rejection of bad data. These capabilities are provided to accomplish the scientific programs of the HRS investigation definition team, which concern the interstellar medium, stellar winds, and evolutionary aspects of stellar atmosphere studies; the determination of chemical abundances relevant to stellar evolution; the investigation of quasars and Seyfert galaxy nuclei; and the analysis of the atmospheres of solar system objects, including comets. Author

N82-33304*# Wisconsin Univ., Madison. Dept. of Astronomy.
THE HIGH SPEED PHOTOMETER FOR THE SPACE TELESCOPE
R. C. Bless *In* Space Telescope Science Inst. The Space Telescope Obs. 1982 p 106-113 (For primary document see N82-33296 23-89)
Avail: NTIS HC A07/MF A01 CSCL 03A

An overview of the high speed photometer (HSP), its optics and detectors, its electronics, its mechanical structure, and some observational considerations are presented. The capabilities and limitations of the HSP are outlined. J.D.

N82-33305*# Texas Univ., Austin. Dept. of Aerospace Engineering.
ASTROMETRIC OBSERVATIONS WITH THE SPACE TELESCOPE
R. L. Duncombe, G. F. Benedict, P. D. Hemenway, W. H. Jeffreys, and P. J. Shelus *In* Space Telescope Science Inst. The Space Telescope Obs. 1982 p 114-120 refs (For primary document see N82-33296 23-89)
Avail: NTIS HC A07/MF A01 CSCL 03A

Astrometry with the Space Telescope (ST) is performed using one of the fine guidance sensors (FGS). The FGS, which is based on a pair of Koester's prism interferometers, one for each axis, is capable of measuring the position of one object relative to another with an accuracy of 0.002 arcseconds. Astrometric Data Reduction Software (ADRS) available to the astrometric user of ST is

described. The kinds of problems the space telescope astrometry team plans to investigate using ST are discussed. Author

N82-33306*# Royal Observatory, Edinburgh (Scotland).
REFLECTIONS ON THE SPACE TELESCOPE
M. S. Longair *In* Space Telescope Science Inst. The Space Telescope Obs. 1982 p 121-134 refs (For primary document see N82-33296 23-89)
Avail: NTIS HC A07/MF A01 CSCL 03A

The significance of the Space Telescope for the advancement of astronomy and astrophysics is described. The current state of knowledge in astronomy and cosmology is summarized and unanswered questions in those fields discussed. The rapid evolution of modern astronomy and the need for systematic observations are stressed. J.D.

N82-33307*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE DEEP SPACE NETWORK: AN INSTRUMENT FOR RADIO ASTRONOMY RESEARCH
N. A. Renzetti, R. M. Taylor, R. D. Shaffer, and P. R. Wolken 1 Aug. 1982 67 p refs
(NASA-CR-169323; JPL-PUB-82-68; NAS 1.26:169323) Avail: NTIS HC A04/MF A01 CSCL 03A

The status of the use of Deep Space Network radio telescopes in conducting radio astronomy investigations is described. Present capabilities as well as future trends are discussed. L.F.M.

N82-33308# Academy of Sciences of the Estonian SSR, Tartu. Inst. Astrofiziki i Fiziki Atmosfery.
SPECTRAL ENERGY DISTRIBUTIONS OF OE AND OEF TYPE STARS
U. Hyanni 1981 59 p refs
(DE82-700135; ASESSR-A-4-1981) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

Scanner observations of the spectral energy distributions of O, Ce, Oef and OBpe stars, carried out in the region extending from 3200 to 9800 A, combined with the TD-1 and OAO-2 ultraviolet spectrophotometry of the same stars. Energy distributions over a wide spectral range, corrected for interstellar reddening were compared with predictions of spherical extended model atmospheres. The observed energy distributions of O supergiants and Oef stars proved to be only slightly or moderately affected by geometrical extension of the atmosphere. It is shown that the energy distribution curves of the Oe dwarfs HD 39680, HD 60848, and of the peculiar CBe star X Per do flatten. DOE

N82-33309# European Southern Observatory, Hamburg (West Germany).
[ACTIVITIES IN ASTRONOMICAL RESEARCH] Annual Report, 1981
1981 63 p refs In ENGLISH, FRENCH and GERMAN Original contains color illustrations
Avail: NTIS HC A04/MF A01

Astronomical research is reported on and research facilities are presented. Studies of binary stars, interstellar matter, stellar composition, galactic nuclei, and X-ray sources are discussed. Telescopes, CCD cameras, spectrographs, and image processing equipment are described. Author (ESA)

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N82-33310*# Princeton Univ. Observatory, N. J.
CHANGES IN INTERSTELLAR ATOMIC ABUNDANCES FROM THE GALACTIC PLANE TO THE HALO
Edward B. Jenkins [1982] 10 p refs
(Grant NsG-5248)
(NASA-CR-169324; NAS 1.26:169324) Avail: NTIS HC A02/MF A01 CSCL 03B

A few, specially selected interstellar absorption lines were measured in the high resolution, far ultraviolet spectra of 200 O and B type stars observed by the International Ultraviolet Explorer (IUE). For lines of sight extending beyond about 500 pc from the galactic plane, the abundance of singly ionized iron atoms increases relative to singly ionized sulfur. However, the relative abundances of singly ionized sulfur, silicon and aluminum do not seem to change appreciably. An explanation for the apparent increase of iron is the partial sputtering of material off the surfaces of dust grains by interstellar shocks. Another possibility might be that the ejecta from type I supernovae enrich the low density medium in the halo with iron. S.L.

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N82-33311*# Cornell Univ., Ithaca, N. Y. Center for Radiophysics and Space Research.
PRODUCTION AND CONDENSATION OF ORGANIC GASES IN THE ATMOSPHERE OF TITAN
Carl Sagan and W. Reid Thompson 1982 54 p refs
(Grants NGR-33-010-082; NGR-33-010-101)
(NASA-CR-169334; NAS 1.26:169334; CRSR-792) Avail: NTIS HC A04/MF A02 CSCL 03B

The rates and altitudes for the dissociation of atmospheric constituents on Titan are calculated for solar ultraviolet radiation, the solar wind, Saturn magnetospheric particles, the Saturn co-rotating plasma, and cosmic rays. Laboratory experiments show that a variety of simple gas phase organic molecules and more complex organic solids called tholins are produced by such irradiations of simulated Titanian atmospheres. Except for ultraviolet wavelengths longward of the methane photodissociation continuum, most dissociation events occur between about 3100 and 3600 km altitude, corresponding well to the region of EUV opacity detected by Voyager. For a wide variety of simple to moderately complex organic gases in the Titanian atmosphere, condensation occurs below the top of the main cloud deck at about 2825 km. It is proposed that such condensates, beginning with CH4 at about 2615 km, comprise the principal mass of the Titan clouds. There is a distinct tendency for the atmosphere of Titan to act as a fractional distillation device, molecules of greater complexity condensing out at higher altitudes. Author

N82-33312*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
JOVIAN MODULATION OF INTERPLANETARY ELECTRONS AS OBSERVED WITH VOYAGERS 1 AND 2
A. W. Schardt, F. B. McDonald, and J. H. Trainor Jul. 1982 52 p refs Submitted for publication
(NASA-TM-83977; NAS 1.15:83977) Avail: NTIS HC A04/MF A01 CSCL 03B

The release of magnetospheric electrons from Jupiter into interplanetary space is modulated by the Jovian rotation period. The Voyager 1 and 2 observations showed that the modulation period agrees on the average with the synodic period of Jupiter (9h 55m 33.12s), but over intervals of weeks it can differ from the synodic period by several minutes. The lack of exact synchronization is attributed to changes of the plasma population in the Jovian magnetosphere. The Jovian modulation appears to be a persistent feature of the interaction between the solar wind and the magnetosphere and the disappearance of the modulation away from Jupiter is attributed to interplanetary propagation conditions. This leads to the following limits on the diffuse coefficient for interplanetary electrons: kappa perpendicular is $< \text{or} = 8 \times 10$ to the 19th power sq cm/s and kappa parallel is $< \text{or} = 10$ to the 21st power sq cm/s. Modulation was still detectable at 3.8 A.U.

behind Jupiter in the far magnetotail. This requires a mean free path in the tail < 0.75 A.U. and good field connection along the tail to Jupiter. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N82-33313*# California Univ., San Diego, La Jolla. Center for Astrophysics and Space Sciences.
SOLAR ANALYSIS OF SOLAR-CONSTANT MONITORING PACKAGE (SMM) Final Report
Hugh S. Hudson Sep. 1982 5 p refs
(Grant NsG-5322)
(NASA-CR-169332; NAS 1.26:169332; SP-82-39) Avail: NTIS HC A02/MF A01 CSCL 03B

The activity cavity radiometer irradiance monitor is supplying the first high precision data on solar total irradiance at the Earth. Thee classes of variability were discovered: large variations of amplitudes up to 0.2%; small high frequency variations in the form of a continuum in the periodogram, extending up to the Nyquist frequency; and sharp spikes at frequencies corresponding to the individual p modes already known from radial velocity measurements. The observed variations (up to 0.3%, on time scales of several days) were identified with sunspot darkness. The data analysis is expected to give information about the solar interior, as well as about the solar input to the terrestrial climate. A.R.H.

N82-33314# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PERIODICITIES IN SUNSPOT NUMBERS
R. P. Kane and N. B. Trivedi Nov. 1981 26 p refs Submitted for publication
(INPE-2256-PRE/038) Avail: NTIS HC A03/MF A01

The annual mean sunspot numbers during 1749 to 1971 are subjected to power spectrum anaysis by the recentmost least-squares linear prediction method evolved by Barrodale and Erickson. For the two consecutive intervals 1749 to 1844 and 1845 to 1971, only one major peak at T = 9.7 yr is common and many other peaks are different, indicating either unreliability of the earlier data, or a possibility that the two samples do not belong to the same population. In general, peaks near T = 5 yr have only border-line significance, peaks near T = 11 yr are highly significant and multiple and probably change with time. In the large periodicity region peaks definitely exist for T = 60 to 100 yr range, but probably change with time. Attempt at prediction of future activity yielded a number less than 100 for cycle 21; much lesser than the observed value of 155 in 1979 to 1980. M.G.

N82-33315*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FAST POLARIZATION CHANGES IN MM MICROWAVE EMISSION OF WEAK MULTISTRUCTURED SOLAR BURSTS
P. Kaufmann, F. M. Strauss, J. E. R. Costa, and B. R. Dennis May 1982 39 p refs Submitted for publication Sponsored in part by FINEP and PAPESP Prepared in cooperation with Inst. de Pesquisas Espaciais, Sao Jose dos Campos, Brazil
(NASA-TM-84720; NAS 1.15:84720; INPE-2393-PRE/110) Avail: NTIS HC A03/MF A01

Circular polarization of weak multistructured solar bursts was measured at mm microwaves with unprecedented sensitivity (0.03 sfu rms) and high time resolution (1ms). It was shown that sudden changes occur in the degree of polarization with time scales of 0.04 to 0.3 s. In most cases the degree of polarization attained maximum values before the maximum flux in both mm microwaves and hard X-rays with time scales of 0.04 to 1.0 s. The timing accuracy in determining the degree of polarization was 40 ms. Physical phenomena are discussed invoking one or a combination of various possible causes for the observed effects. The bursts at mm microwaves were weak compared to the contribution of the preexisting active regions, and therefore the changes in magnetoionic propagation conditions for emerging radiation plays an important role in the observed effects. Composite effects due to more than one polarizing mechanism or more than one polarized spots within the antenna beam are discussed. S.L.

N82-33316# Ruhr Univ., Bochum (West Germany). Inst. fuer Hoch und Hoechstfrequenztechnik.
HELIOS OCCULTATION EXPERIMENT: REMOTE SENSING OF PLASMA BY TIME DELAY MEASUREMENTS Final Report, Sep. 1981
Peter Edenhofer Bonn Bundesministerium fuer Forschung und Technologie Dec. 1981 97 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-W-81-051; ISSN-0170-1339) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20,60

The Helios Occultation Experiment (radio science: S band time delay measurements) is presented. Typical Doppler, range, and electron content measurements made during three solar occultations at heliocentric distances greater than three solar radii, allowing for remote sensing of solar coronal and interplanetary plasma up to Earth orbit (within ecliptic plane), are considered. Favorable aspects of the Helios orbital geometry and remote sensing technique are reported and estimates of accuracy of measurements are given. Results of scientific data analysis pertain to: derivation of a steady state, spherically symmetric (equatorial) coronal plasma model; investigations of wavelike phenomena of electron content measurements; electron density distribution by inversion of time delay data; speed analysis of plasma disturbances in the turbulent corona; and discussion of specific solar events. Author (ESA)

N82-33317# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 446, OCTOBER 1981. PART 2: COMPREHENSIVE REPORTS. DATA FOR APRIL 1981, AND MISCELLANEA
Helen E. Coffey Oct. 1981 92 p
(PB82-171083; SGD-446-PT-2; NOAA-81121502) Avail: NTIS HC A05/MF A01 CSCL 03B

In addition to an index for 1980-1981, data for April 1981 on solar radio emission, solar X-ray radiation, and mass ejections from the Sun is given. A new schedule will cause the daily flare index and the regional flare index to appear 13 and 14 months from the date of observation. Active regions from 9 February to 4 April 1981, synoptic solar maps from 9 February to 4 April 1981 and the International Geophysical Calendar for 1982 are included. GRA

N82-33318# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA. PART 1: PROMPT REPORTS. DATA FOR AUGUST 1981, JULY 1981 AND LATE DATA
Helen E. Coffey, ed. Sep. 1981 192 p 2 Vol.
(PB82-153032; SGD-445-Pt-1; NOAA-81110401-Pt-1) Avail: NTIS HC A09/MF A01 CSCL 03B

In addition to an index for 1980-1981, data is given on alert periods, daily solar indices, solar flares, solar radio emission, solar wind measurements, spacecraft observations, inferred interplanetary magnetic field polarities, mean solar magnetic field, and the Boulder Geomagnetic Substorm Log. It also provides data for July 1981 on daily solar activity centers, sudden ionospheric disturbances, spacecraft observations, solar radio emission, cosmic rays, geomagnetic indices, and radio propagation indices. Late data includes solar wind measurements for July 1981, solar radio emission for June 1981, cosmic rays for June 1981, and geomagnetic indices. GRA

N82-33319# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA. PART 2: COMPREHENSIVE REPORTS. DATA FOR MARCH 1981, JANUARY 1980 AND

MISCELLANEA
Helen E. Coffey, ed. Sep. 1981 100 p 2 Vol.
(PB82-153040; SGD-445-Pt-2; NOAA-81110402-Pt-2) Avail: NTIS HC A05/MF A01 CSCL 03B

In addition to an index for 1980-1981, comprehensive reports provide data for March 1981 on solar radio emission, solar X-ray radiation and mass ejections from the Sun. A new schedule will cause the daily flare index and the regional flare index to appear 13 and 14 months from the data of observation. January 1980 solar flares are listed. The regional flare index for December 1979 is also given. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

N82-33320*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EARTH RADIATION SCIENCE SEMINARS
John B. Hall, Jr., comp. Aug. 1982 175 p refs Seminars held at Hampton, Va., Jun. 1980 - Oct. 1981
(NASA-CP-2239; L-15483; NAS 1.55:2239) Avail: NTIS HC A08/MF A01 CSCL 03B

NOTICE: Available to U.S. Government Agencies and Their Contractors.

Earth radiation budget experiments, instrumentation, computational methods, and the effect of increased CO2 on climate were discussed. For individual titles, see N82-33321 through N82-33328.

N82-33321*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ORBITAL MEASUREMENTS OF THE EARTH'S RADIATION BUDGET DURING THE FIRST DECADE OF THE SPACE PROGRAM
William R. Bandeen *In* NASA. Langley Research Center Earth Radiation Science Seminars Aug. 1982 p 1-28 refs (For primary document see N82-33320 23-93)
Avail: NTIS HC A08/MF A01 CSCL 03B

The instrumentation and data analysis methods applied to data from the Explorer 7, TIROS 2, 3 , 4, and 7, and Nimbus 2 and 3 experimental satellites are summarized. Problems encountered in analyzing these data included: determining the value of the solar constant, inaccuracies introduced by degradation of the sensors in orbit, the need to infer the total reflected and emitted radiation from filtered measurements, the development of corrections for anisotropy in order to determine the outgoing flux densities at the moment of measurement, and the development of corrections to account for diurnal variability. The corrections for long- and shortwave anisotropy and historical determinations of the solar constant and albedo are treated in detail. These early measurements indicated that the planetary albedo was lower, the emitted radiation higher, and the equator-to-pole gradient of net radiation greater than previously supposed. J.D.

N82-33322*# State Univ. of New York, Stony Brook. Lab. for Planetary Atmospheres Research.
INCREASED ATMOSPHERIC CARBON DIOXIDE AND CLIMATE FEEDBACK MECHANISMS
Robert D. Cess *In* NASA. Langley Research Center Earth Radiation Science Seminars Aug. 1982 p 28-44 refs (For primary document see N82-33320 23-93)
Avail: NTIS HC A08/MF A01 CSCL 03B

As a consequence of fossil fuel burning, the atmospheric concentration of carbon dioxide has increased from 314 ppm in 1958, when detailed measurements of this quantity began, to a present value of 335 ppm; and it is estimated that during the next century, the CO2 concentration will double relative to its assumed preindustrial value of 290 ppm. Since CO2 is an infrared-active gas, increases in its atmospheric concentration would lead to a larger infrared opacity for the atmospheric which, by normal logic, would result in a warmer Earth. A number of modeling endeavors suggest a 2 to 4 C increase in global mean surface temperature with doubling of the CO2 concentration. But such estimates of CO2-induced warming are highly uncertain because of a lack of knowledge of climate feedback mechanisms. Interactive influences upon the solar and infrared opacities of the Earth-atmosphere system can either amplify or damp a climate-forcing mechanism such as increasing CO2. Climate feedback mechanisms discussed include climate sensitivity, cloudiness-radiation feedback, climate change predictions, and interactive atmospheric chemistry. J.D.

N82-33323*# Colorado State Univ., Fort Collins.
REGIONALLY APPLICABLE ANGULAR REFLECTANCE MODELS
J. M. Davis *In* NASA. Langley Research Center Earth Radiation Science Seminars Aug. 1982 p 45-52 refs (For primary document see N82-33320 23-93)
Avail: NTIS HC A08/MF A01 CSCL 03B

Determination of the angular variation of the reflected radiance field in order to infer the reflected component of the Earth radiation budget from medium or narrow field of view radiometer measurements is discussed. An average angular model applicable at 250 to 1000 km is presented and evaluated. The nature of the convergence of the radiance patterns to the regional means is also discussed. Radiances measured during summer Monex 1979, from Hudson Bay to Saudi Arabia, were averaged and then normalized by multiplying by pi and dividing by the scene-averaged reflected flux density. This casts the model into the inverse of the bidirectional reflectance normalization coefficient, which has the value of unity for an isotropic surface. The reflected component of the Earth's radiation budget is inferred to an accuracy of about 2.5%. J.D.

N82-33324*# Institut Royal Meteorologique de Belgique, Brussels.
FUNDAMENTALS OF ABSOLUTE PYROHELIOMETRY AND OBJECTIVE CHARACTERIZATION
D. A. Crommelynck *In* NASA. Langley Research Center Earth Radiation Science Seminars Aug. 1982 p 53-88 ref (For primary document see N82-33320 23-93)
Avail: NTIS HC A08/MF A01 CSCL 03B

The radiometric methodology in use with a narrow field of view radiometer for observation of the solar constant is described. The radiation output of the Sun is assumed to be constant, enabling the monitoring of the solar source by an accurately pointed radiometer, and the Sun's output is measured as a function of time. The instrument is described, its angular response considered, and principles for absolute radiometric measurement presented. Active modes of operation are analyzed, taking into consideration instrumental perturbations and sensor efficiency, heating wire effect, cavity sensor efficiency, thermal effects on the surface of the sensitive area, the effect of the field of view limiting system, and the frequency response of the heat flux detector and absolute radiometric system. Performance of absolute measurements with relatively high accuracy is demonstrated. J.D.

N82-33325*# Cologne Univ. (West Germany).
DERIVATION OF THE RADIATION BUDGET AT GROUND LEVEL FROM SATELLITE MEASUREMENTS
Ehrhard Raschke *In* NASA. Langley Research Center Earth Radiation Science Seminars Aug. 1982 p 89-98 ref (For primary document see N82-33320 23-93)
Avail: NTIS HC A08/MF A01 CSCL 03B

Determination of the Earth radiaton budget and progress in measurement of the budget components and in the treatment of imaging data from satellites are described. Methods for calculating the radiation budget in a general circulation model, radiative transfer characteristics of clouds, computation of solar radiation at ground

level using meteorological data and development of a 10-channel radiometer are discussed. J.D.

N82-33326*# Michigan Univ., Ann Arbor.
MEASUREMENT OF SOLAR RADIATION AT THE EARTH'S SURFACE
Fred L. Bartman *In* NASA. Langley Research Center Earth Radiation Science Seminars Aug. 1982 p 99-132 refs (For primary document see N82-33320 23-93)
Avail: NTIS HC A08/MF A01 CSCL 03B

The characteristics of solar energy arriving at the surface of the Earth are defined and the history of solar measurements in the United States presented. Radiation and meteorological measurements being made at solar energy meteorological research and training sites and calibration procedures used there are outlined. Data illustrating the annual variation in daily solar radiation at Ann Arbor, Michigan and the diurnal variation in radiation at Albuquerque, New Mexico are presented. Direct normal solar radiation received at Albuquerque is contrasted with that received at Maynard, Massachusetts. Average measured global radiation for a period of one year for four locations under clear skies, 50% cloud cover, and 100% cloud cover is given and compared with the solar radiation at the top of the atmosphere. The May distribution of mean daily direct solar radiation and mean daily global solar radiation over the United States is presented. The effects of turbidity on the direct and circumsolar radiation are shown. J.D.

N82-33327*# Michigan Univ., Ann Arbor.
SOLAR RADIATION AT THE EARTH'S SURFACE: ITS CALCULATION AND INFERENCE FROM SATELLITE IMAGERY
Fred L. Bartman *In* NASA. Langley Research Center Earth Radiation Science Seminars Aug. 1982 p 133-158 refs (For primary document see N82-33320 23-93)
Avail: NTIS HC A08/MF A01 CSCL 03B

Physical and empirical models for calculation of insolation on a horizontal surface are described. Calculation of the spectral components of insolation and the calculation of the integrated values using wavelength-averaged values, ignoring aerosol effects, are discussed. Empirical models for determining insolation from meteorological data under clear and cloudy skies are described. The influence of hourly and daily global solar radiation from GOES satellite images is illustrated. Data acquisition methods for the Great Plains experiment, the determination of cloud free brightness levels, and determination of cloud parameters and target brightness are considered. The use of two and seven satellite images per day resulted in insolation determinations having a standard error of less then 10% of the mean. Use of only one image per day resulted in a standard error of about 20% of the mean. J.D.

N82-33328*# University Coll., London (England).
METEOSAT STUDIES OF CLOUDS AND RADIATION BUDGET
R. W. Saunders *In* NASA. Langley Research Center Earth Radiation Science Seminars Aug. 1982 p 159-173 refs (For primary document see N82-33320 23-93)
Avail: NTIS HC A08/MF A01 CSCL 03B

Radiation budget studies of the atmosphere/surface system from Meteosat, cloud parameter determination from space, and sea surface temperature measurements from TIROS N data are all described. This work was carried out on the interactive planetary image processing system (IPIPS), which allows interactive manipulation of the image data in addition to the conventional computational tasks. The current hardware configuration of IPIPS is shown. The I(2)S is the principal interactive display allowing interaction via a trackball, four buttons under program control, or a touch tablet. Simple image processing operations such as contrast enhancing, pseudocoloring, histogram equalization, and multispectral combinations, can all be executed at the push of a button. J.D.

N82-33329*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RELATIVISTIC PARTICLES AND GAMMA-RAY IN QUASARS AND ACTIVE GALACTIC NUCLEI
R. J. Protheroe and D. Kazanas Jul. 1982 8 p refs Presented at NATO Advanced Study Inst. on Composition and Origin of Cosmic Rays, Erice, Italy, 20-30 Jun. 1982 Submitted for publication
(NASA-TM-38974; NAS 1.15:38974) Avail: NTIS HC A01/MF A01 CSCL 03B

A model for a class of quasars and active galactic nuclei is described in which a shock around a massive black hole randomizes the infall kinetic energy of spherically accreting matter producing a nonthermal spectrum of high energy protons. These protons may be responsible for the secondary production (via tau + or - decay) of the radio emitting high energy electrons and also of high energy gamma rays (via pi decay and inverse Compton interactions of the electrons). The correlation between radio and gamma ray emission implied by the model is in good agreement with observations of 3C273. Observation of the flux of high energy neutrinos from quasars may provide a test for the model. Author

99 GENERAL

N82-33330*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LANGLEY TEST HIGHLIGHTS, 1981
Jul. 1982 56 p
(NASA-TM-84519; NAS 1.15:84519) Avail: NTIS HC A04/MF A01 CSCL 05A

Significant aircraft tests which were performed are highlighted. The broad range of the research and technology activities. The conributions of this work toward maintaining United States leadership in aeronautics and space research are illustrated. S.L.

N82-33331# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
CALENDAR OF SELECTED AERONAUTICAL AND SPACE MEETINGS
Jul. 1982 122 p
(AGARD-CAL-82/1) Avail: NTIS HC A06/MF A01

A calendar of international scientific and technical meetings is presented. Technical meetings, conferences, and symposia, held in all parts of the world, in the field of aerospace research and development as well as in other directly related scientific fields, such as energy, geophysics, and acoustics are included. These meetings are listed in chronological order. S.L.

N82-33332*# National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICS AND SPACE REPORT OF THE PRESIDENT: 1981 ACTIVITIES
1981 92 p refs
(NASA-TM-84719; NAS 1.15:84719) Avail: NTIS HC A05/MF A01 CSCL 05B

Achievements in the aeronautics and space program by function are summarized. Activities in communications, Earth's resources and environment, space science, space transportation, international activities, and aeronautics are included. S.L.

N82-33333# Office of Naval Research, San Francisco, Calif.
ONR FAR EAST SCIENTIFIC BULLETIN, VOLUME 7, NUMBER 1, JANUARY-MARCH 1982
Young B. Kim, ed. and Mary Lou Moore, ed. Jan. 1982 112 p
(AD-A115761) Avail: NTIS HC A06/MF A01 CSCL 05/2

Contents: Robot Control in Japan; Welding Robots in Japan; International Symposium on GaAs and Related Compounds and Related Laboratory Visits; Fifth International Symposium on Gallium Arsenide and Related Compounds; Visits to Laser Research Laboratories in Japan; The Central Research Laboratory of the Mitsubishi Electric Corporation The National Physical Laboratory, New Delhi, India; Recent Developments in Applied Superconductivity in Japan; International Meetings in the Far East, 1982-1986. GRA

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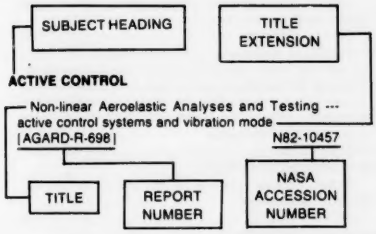

The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7051).

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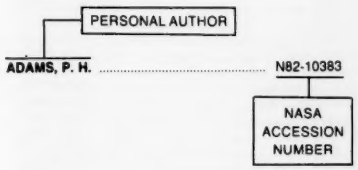

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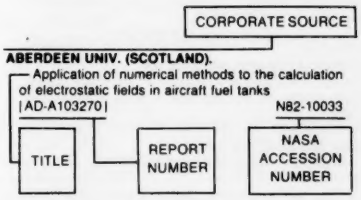

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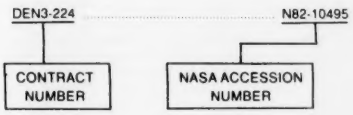

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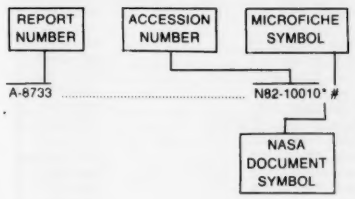

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